MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

WASHINGTON, D. C., MAY, 1882.

WAR DEPARTMENT,

OFFICE OF THE CHIEF SIGNAL OFFICER,

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

This REVIEW presents a general summary of the meteorological data collected by the Signal Service during the month of May, 1882.

In the preparation of this REVIEW have been used; viz.: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty-six Signal Service stations and thirteen Canadian stations, as telegraphed to this office; one hundred and eighty-three monthly journals and one hundred and seventy-four monthly means from the former, and thirteen monthly means from the latter; two hundred monthly registers from voluntary observers; fifty-three monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; Marine Reports through the co-operation of the New York Herald Weather Service; abstracts of Ships' Logs, furnished by the publishers of "The New York Maritime Register;" monthly reports from the local weather services of Kansas, Nebraska, and Missouri, and of the Central Pacific railway company; trustworthy newspaper extracts; special reports.

The more prominent meteorological conditions of the month have been:

1. The deficiency in temperature, which except in California, has been in all the other states and territories, below the mean for the month, averaging 5° below in New England, the middle Atlantic states, and Tennessee, 6° below in the lake region and the Ohio valley, and 7° below in the northwest.

2. The great excess of rainfall in the Ohio valley, amounting to more than four and five-tenths inches, and in Tennessee and the lower lakes, amounting to nearly three inches. In Arkansas the rainfall has been unusually heavy (especially in the vicinity of Little Rock, where the amount exceeded fifteen inches), but owing to lack of data from that section in previous years, comparison cannot be made. The excessive rainfall and continued cold has had a depressing effect, it is reported, on the cotton crop, but from all states the prospects are very encouraging for fruits and cereals.

A new feature of the WEATHER REVIEW is continued under the head of "Cotton Region Reports." The Chief Signal Officer began in April a system of daily telegraphic reports for the benefit of those interested in this staple, and the accompanying table gives the monthly mean of the maximum and minimum temperatures and the average rainfall for the month, in the various cotton districts throughout the south.

That part of the REVIEW referring to international meteorology presents the general weather conditions which prevailed over the northern hemisphere during the month of March, 1880, and the tracks of barometric minima for June, 1880, traced from simultaneous observations taken at 7:35 a. m., Washington mean time.

A large number of icebergs were encountered by vessels during the month. The comparison of chart vii. with that of April, shows that the limits within which ice was observed did not extend as far southward and westward during the present month, but it still suggests the advisibility of selecting the southern routes for vessels passing to and from Europe at this season of the year. Under the heading, "Ocean Ice" will be found special reports giving the latitude and longitude in which icebergs were observed.

BAROMETRIC PRESSURE.

The mean barometric pressure for the month over the United States and Canada is shown by the isobarometric lines, in black on chart ii. The area of lowest mean pressure is central in Arizona and New Mexico. An area of high pressure, belonging to the high barometer of the Atlantic ocean, extends over the middle Atlantic and south Atlantic states. The barometer is highest on the coast of Oregon, and Washington territory. A comparison of this chart shows an approach to the usual distribution of pressure in summer, a low area covering the interior of the continent. Compared also with the previous month the pressure is slightly higher in New England, Saint Lawrence valley, the Canadian maritime provinces, and in the north Pacific coast region, but is nearly one-tenth of an inch lower at stations in Montana, Dakota, and Minnesota, and thence to Arizona, New Mexico, and northern Texas.

DEPARTURES FROM THE NORMAL VALUES FOR THE MONTH.

Compared with the means of previous years, the pressure over the country east of the Mississippi river below the forty-third parallel of latitude and in Maine, ranges from normal to nine-hundredths of an inch below the normal; in the upper lake region it is from three-hundredths to seven hundredths of an inch above the normal; in the extreme northwest and upper Missouri valley, it ranges from two-hundredths to eight-hundredths of an inch above the normal; in the west Gulf states and the north Pacific coast region it is about normal; at Rocky mountain stations, from two-hundredths to five-hundreths of an inch below the normal; and in southern California it is slightly above the normal.

BAROMETRIC RANGES

The range of pressure during the present month has varied from twenty-nine hundredths of an inch to one and seven hundreths inches. The least range being at Key West, and the greatest at New London, Connecticut. In the several districts the barometric ranges have been as follows:

New England: from 0.76 inch on summit of Mount Washington to 1.04 inches at New Shoreham and 1.07 inches at New London.

Middle Atlantic states: from 0.82 inch at Lynchburgh and 0.83 inch at Williamsport, to 1.01 inches at Barnegat and Sandy Hook and 1.03 inches at New York.

South Atlantic states: from 0.48 inch at Jacksonville to 0.80 inch at Hatteras and 0.82 inch at Kittyhawk.

Florida peninsula: from 0.29 inch at Key West to 0.41 inch at Cedar Keys.

East Gulf states: from 0.48 inch at New Orleans to 0.62 inch at Starkville, Mississippi.

West Gulf states: from 0.47 inch at Port Eads to 0.77 inch at Denison and 0.82 inch at Fort Gibson.

Rio Grande valley: from 0.61 inch at Brownsville to 0.83 inch at Eagle Pass.

Ohio valley and Tennessee: from 0.64 inch at Memphis and 0.66 inch at Chattanooga to 0.82 inch at Pittsburgh.

Lower lake region: from 0.81 inch at Sandusky and 0.82 inch at Erie and Toledo to 0.87 inch at Buffalo, Detroit and Rochester.

Upper lake region: from 0.57 inch at Duluth and 0.62 inch at Marquette to 0.91 inch at Port Huron and 0.96 inch at Alpena.

Extreme northwest: from 0.62 inch at Fort Buford to 0.82 inch at Bismarck.

Upper Mississippi valley: from 0.70 inch at Cairo to 0.83 inch at Keokuk and 0.84 in at Springfield, Illinois.

Missouri valley: from 0.73 inch at Springfield, Missouri, to 1.03 inches at Fort Bennett, Dakota.

Northern slope: from 0.58 inch at Fort Assinniboine and 0.59 inch at Fort Keogh and Fort Washakie to 0.99 inch at North Platte.

Middle slope: from 0.58 inch on the summit of Pike's Peak to 0.90 inch at Dodge City.

Southern slope: from 0.49 inch at El Paso to 0.80 inch at Jacksborough and 0.83 inch at Henrietta.

Southern plateau: from 0.37 inch at Camp Thomas to 0.60 inch at Santa Fé.

Middle plateau: from 0.43 inch at Pioche to 0.55 inch at Winnemucca.

Southern plateau: from 0.49 inch at Eagle Rock to 0.80 inch at Umatilla and 0.81 inch at Fort Missoula.

North Pacific coast region: from 0.58 inch at Roseburg to 0.71 inch at Olympia and 0.72 inch at Portland.

Middle Pacific coast region: from 0.41 inch at San Francisco to 0.46 inch at Red Bluff.

South Pacific coast region: from 0.35 inch at Campo to 0.49 inch at Yuma.

AREAS OF HIGH BAROMETER.

Five well-defined areas of high barometer have appeared within the limits of the chart for the month of May, 1882. These areas have pursued a general track to the south of east; two were first noted in the northwest; one over the lake region and pressing southward; one in the maritime provinces of Canada, and the fifth in Washington territory and Oregon. An examination of the chart of areas of low barometer (chart i.) shows the great influence exercised by high area number ii. in stopping the progress of storm-centre number i.; also of the influence of high area number iii. in delaying the movement of storm-centre number ii. for three days in the Ohio valley.

I.—On the first there was a sharp rise in barometric pressure in the northwest and in the upper lake region. This high area was situated between a low area in the maritime provinces of Canada and a great depression entering the north Pacific coast region. On the second the high barometer moved slightly to the south of east over the lake region and Ohio valley to the middle Atlantic coast; at the midnight observation of this day fair or clear weather was reported from all stations east of the Mississippi river. At the morning observation of the third the isobar of 30.4 included Lynchburg, Washington, Chincoteague, and Baltimore; during the day there was a general fall of pressure east of the Rocky mountains, the sharpest fall being in the lake region and New England, and at the midnight report the highest isobar, 30.1, included the south Atlantic states. During the fourth this high barometer disappeared from the chart in advance of low area i. then entering Kansas, Colorado, Iowa, and Missouri. During the progress of this high area from Dakota to the Atlantic coast, the pressure at the centre of the high barometer averaged 0.3 inch above the mean for the month.

The minimum temperatures for the month are associated with this area, in the northwest, lake region, Ohio valley, middle states, and New England. Cautionary off-shore signals ordered on the second, in connection with this high pressure, from Sandy Hook to Chincoteague were justified by the following velocities: Chincoteague, 29, nw.; Delaware Breakwater, 40, nw.; Cape May, 36, nw.; Barnegat, 32, nw.; Sandy Hook, 36, nw. Cautionary signals were displayed on the second on the North Carolina coast, and the following maximum velocities were reported: Macon, 32, e.; Hatteras, 44, ne. Kittyhawk, 41, ne.; Cape Henry, 27, n.

II.—On the fourth, during the march of low area i. over Kansas and Missouri, there was a sharp rise of pressure over the northern portion of the lake region, accompanied by brisk to high northeasterly winds, light rain and a decided fall in temperature. On the fifth this high area, which barred the natural track of depression i., pressed steadily to the southward, with a rise averaging 0.3 inch in the northwest and 0.2 inch in the lake region, middle states and, New England, with a marked fall of temperature in the same districts, the thermometer being nearly 20° below the mean for the month. On the sixth, the high barometer extended over the lake region, middle states, and New England; on this day low area i., which had entered Illinois, was filled up by the inflowing air and ceased to exist as a depression; in the mean time a new depression low area ii. was developing in the Rio Grande valley.

On the seventh, the region of highest barometer was transferred to the middle Atlantic states, which were enclosed by the isobar of 30.4, as well as Connecticut and Rhode Island; the pressure in the upper lakes yielding in the meantime before the advance of low area ii. On the eighth, during a sharp fall of mercury in the middle states and New England, the high area was transferred to the south Atlantic states, and on the ninth this area disappeared before the advance of low area ii., which had begun to recurve to the eastward and was then central in the northwest. In connection with the steep barometric gradient existing between this high area and low area i., cautionary signals were ordered for the lake region, and the following maximum velocities were reported: Erie, 27, ne.; Sandusky, 37, ne.; Toledo, 54, e.; Port Huron, 41, ne; Chicago, 27 ne.; Milwaukee, 32, n.

III.—On the tenth, the barometer rose 0.3 inch in the maritime provinces while low area number ii. was entering the lower lake region. On the eleventh the pressure continued rising, and the increase of pressure extended over New England and the middle Atlantic states, delaying the advance of depression ii. to the eastward. On the twelfth the barometer remained high in the same region, and during its continuance on the tenth, eleventh, and twelfth, low area ii. remained nearly stationary in the Ohio valley. On the thirteenth the high area disappeared to the eastward beyond the limits of the chart.

IV.—On the tenth, the pressure rose 0.4 inch in Minnesota in rear of low area ii., then entering the lake region. On the eleventh the rise extended over Manitoba and all the northwest and upper lake region, the highest barometer reported, 30.34, at Fort Garry, being 0.4 inch above the normal for the month. On the twelfth, the highest barometer remained central over Manitoba and Minnesota, but the pressure rose over all the region from the lakes to the south Atlantic and Gulf coasts. On the thirteenth the high pressure maintained nearly the same location, remaining about 0.3 inch above the normal for the month. On the fourteenth and fifteenth, the barometer rose in all the states east of the Mississippi river, although the

pressure still continued highest in the northwest and lake region. On the sixteenth the center of high barometer moved to Illinois and Indiana; at the midnight observation, unusually clear weather prevailed in all the states. On the seventeenth there was a rapid transfer of the highest pressure to the maritime provinces of Canada, the highest readings at the midnight observation being Farther Point and Chatham, 30.44 or 0.53 inch above the normal. Also at this observation the barometer, except in a slight portion of the extreme northwest, was in all the United States above the mean for the month. On the eighteenth the pressure still continued rising in the maritime provinces, the highest barometers reported being Farther Point, 30.58; Chatham, 30.59; Halifax, 30.55; Sydney 30.6. It is worthy of note that although there was an area of low barometer in Dakota and Minnesota, fair weather prevailed in all the country east of the Mississippi river except along the New England coast, where cloudy weather, with brisk to high northeast winds and light rain were reported. The distribution of pressure observed in the maritime provinces and New England, giving a barometric gradient producing northeasterly winds, is generally accompanied by rain, first beginning along the coast and then extending inland. On the nineteenth there was a general decrease of pressure in all the districts, although the barometer still continued highest in Nova Scotia. On the twentieth this area, the most important of the month, ceased to exist as a high pressure. In connection with this area and low area ii., the minimum temperatures for the month generally occurred in the south Atlantic, Gulf states, and Tennessee.

V.—On the eighteenth there was a marked increase of pressure in Washington territory and Oregon; on the nineteenth the increase extended into Idaho; on the twentieth the highest pressure was central in Montana, where the barometer averaged 0.4 inch above the mean for the month. On the twenty-first, the high area moved into Dakota, and on the twenty-second, moved by a southeasterly course into Iowa and Missouri; twenty-third, the highest pressure was central in Illinois; on the twenty-fourth, it was very rapidly transferred to the middle Atlantic coast in advance of a rain-area approaching from the west, and on the succeeding day it ceased to prevail as a high area.

AREAS OF LOW BAROMETER.

Four areas of low barometer have appeared within the limits of, or approached the stations of observation during the month, which were sufficiently well defined to render it possible to approximately determine the positions of the centres at consecutive telegraphic reports. The tracks of the centres of these depressions are exhibited on chart i. Compared with May of previous years, the barometric disturbances have been less than the average for May.

The following table shows the number of areas of low barometer occurring during the month of May since 1874, as traced on chart i, of THE MONTHLY WEATHER REVIEW:

Month.	Year.	No.	Month.	Year.	No.
May,	1874,	8.	May.	1878,	13.
"	1875,	11.	"	1879,	14.
"	1876,	11.	"	1880,	10.
"	1877,	5.	"	1881,	5.

The following table gives the latitude and longitude in which each area was first and last observed during the month of May, 1882, with the average hourly velocity:

Areas of low barometer.	First Observed.		Last Observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I.	46°	124°	39°	88°	19
II.	29°	102°	40°	72°	17
III.	44°	123° 5′	46° 5′	61°	30
IV.	46° 5′	103°	45°	78° 5′	29.5

The storm-tracks of the present month are in general to the north of those of the preceding month, which was to be expected. The track of low area ii. is in the earlier portion of its course very unusual for May, as in that month storms seldom develop south of latitude 85° N. Perhaps the most remarkable feature of these storm-areas is the influence exerted by areas of high pressure in absolutely checking the progress of low area i., and of delaying depression ii. for two days in the Ohio valley, as will be seen more fully set forth in the detailed description of these storm-centres.

I.—On the first, a great depression, moving in an easterly track, entered Washington territory and Oregon, the lowest barometer readings averaging 0.35 inch below the mean for the month. On the second, the low area continued its easterly course accompanied by light rains in Idaho and Montana. On the third, the movement of the centre of depression was not well-defined but it evidently took a southerly path; at the morning report of the fourth the center was in Kansas; during the day the storm-area moved with an increase of energy to eastern Kansas. At midnight the lowest barometers observed were: Leavenworth, 29.48; Des Moines, 29.51; Omaha, 29.54, being below the normal pressure for the month 0.46, 0.45, and 0.4 inch respectively. Thunder-storms were reported form the Ohio valley, Illinois, Indiana, Missouri, and Arkansas. On the fifth, the storm-centre moved slowly to the east into Illinois, but its progress was checked by high area ii., which was then entering the lake region. The following heavy rainfalls were reported, in inches, during the prevalence of this storm: Champaign, 3.6; Springfield, Illinois, 3.57; Des Moines, 2.81; Cedar Rapids, Iowa, 3.25. On the sixth, the centre of low area was filled up by the in-flowing air from the high pressure in the lake region. The maximum temperatures for the month in the lower Missouri valley, Indian territory, and northwestern Texas were associated with this low area.

II.—On the fourth, the pressure was below the mean in the Rio Grande valley, and continued slowly decreasing until, at the midnight observation of the sixth, a storm of considerable energy was developed; the barometer at Eagle Pass, 29.38, was 0.53 inch below the normal. At this hour the distribution of pressure should be noted, as it will probably account for the anomalous direction of the movement of the storm-centre on the seventh and eighth. The pressure averaged 0.2 inch above the mean in the lake region, middle Atlantic states, and New England, and 0.3 inch above the mean in the Saint Lawrence valley, thus presenting an obstacle to the natural course of the low area to the northeast. At the same time, the pressure was about 0.25 inch below the mean in New Mexico, Colorado and Wyoming, and the depression for the next two days, followed very nearly the path of least resistance. On the seventh the storm-centre, increasing in energy, moved to the northward, as charted, the lowest barometric readings reported being: Dodge City, 29.3; North Platte, 29.36; below the normal, respectively, 0.57 and 0.53 inch. During the day the pressure increased along the Atlantic coast, being nearly 0.4 inch above the mean in the middle Atlantic states and New England, and decreased 0.4 inch in Nebraska. On the eighth, the storm-centre moved slowly to the northward, the lowest barometer reported being, at the morning observation at North Platte, 29.2, or 0.7 inch below the normal. While the storm-centre was moving on the eighth over Nebraska and into Dakota, there was a general decrease of pressure in the lake region, Saint Lawrence valley, middle Atlantic states and New England, and when this storm-area recurved to the eastward, as shown by the morning report of the ninth, the pressure was below the mean in all the districts just mentioned. On the ninth and tenth the depression moved in a southeasterly course and became central in Ohio, where the lowest pressures were 0.4 inch below the mean for the month; during these two days the barometer rose in the maritime provinces and New England, and at the midnight report of the tenth, a high pressure barred the natural track of the low area. For the next two days the storm-

centre remained nearly stationary in the states of Indiana, Ohio and Kentucky, while the barometer remained high in Canada and New England, and below the mean in all the southern states. General rains were reported from the northwest, lake region, Ohio valley, Tennessee, middle Atlantic states, and New England. On the thirteenth, at the morning observation, the centre of depression was near Cincinnati, and during the day it moved, but with diminished energy, to the North Carolina coast. On the fourteenth the low area pursued, showing but slight energy, a northeasterly track along the coast and beyond the limits of the chart. During the passage of the area the maximum temperatures for the month were reported, generally in Maryland, Virginia, North Carolina, South Carolina. Cautionary signals displayed on the Atlantic coast for this storm were generally justified by the following maximum velocities: Boston, 26, ne.; Block Island, 48, ne.; New London, 25, ne.; New Haven, 30, ne.; New York, 42, ne.; Sandy Hook, 47, e.; Barnegat, 48, e.; Atlantic City, 48, e.; Cape May, 41, ne.; Delaware Breakwater, 58, e.; Chincoteague, 28, ne.: Cape Henry, 36, ne.; Kittyhawk, 30, n.; Hatteras, 34, sw. The following vessel reports, furnished through the co-operation of "The New York Herald Weather Service," and the co-operating observers of the merchant marine, probably indicate the presence of this storm during its passa e eastward over the ocean: 14th, S. S. "Seminole" in N. 38° 26′. W. 74° 35′, barometer, 29.50, fresh ne. wind, rainy; 15th, S. S. "Ohio," in N. 30° 29′, W. 64° 52′; 29.47, sse, overcast, rainy; 20th, S. S. "Holland," in N. 43° 00′, W. 45° 21′; strong nw. gale, heavy beam sea.

III.—On the twenty-first the pressure fell below the mean on the coasts of Washington territory and Oregon, and continued slowly falling until the midnight observation of the twenty-fourth; on the twenty-fifth the centre of depression moved in a southeasterly track into northwestern Colorado, accompanied by light rains in its southern quadrant. On the twenty-sixth it continued a southeasterly course into northern Texas. The southeasterly course of this depression during the twenty-fifth and twenty-sixth is not an unusual one for areas of low barometer crossing the Rocky mountains; but after the midnight observation of the twenty-sixth the storm-centre pursued the more usual course to the northeast, moving on the twenty-seventh, into the Ohio valley, from which region severe thunder storms were generally reported. On the twenty-eighth the area of lowest pressure extended in an elliptical form over the middle and south Atlantic states, and Tennessee and the Ohio valley, and heavy rains and severe thunder-storms were reported from all those districts. On the twenty-ninth the storm-centre moved along the New England coast and beyond the limits of the chart. On this day occurred the lowest barometric readings observed during this depression: Block Island and Provincetown, 29.57; Portland, 29.55; Eastport and Chatham, 29.56; Anticosti, 29.46. Cautionary signals, ordered for this storm on Lakes Michigan and Erie, were justified only at scattering stations. The following reports furnished through the co-operation of "The New York Herald Weather Service," probably indicate the presence of this storm during its passage eastward over the ocean: 30th, S. S. "W. A. Scholten," in N. 41° 21′, W. 53° 19′, barometer 29.55, n.w., force 5, rough sea; s. s. "Lepanto," in N. 43° 29′, W. 44° 53′, strong south wind, force 6, overcast and rain.

IV.—At the afternoon report of the twenty-ninth a depression was developed in Dakota. On the thirtieth it moved slowly over Minnesota with light rains reported from all stations in the northwest and upper lake region; the lowest pressure reported was at Saint Paul, 29.52, or 0.41 inch below the normal. On the thirty-first the storm-centre pursued, with a considerable increase of energy, an easterly track over lakes Michigan and Huron. It was during the progress of this low area that the maximum temperatures for the month was reported from the lower lakes and the middle Atlantic states. Cautionary signals were ordered for this storm on Lake Erie, the following maximum velocities being reported: Cleveland, 28, sw.; Sandusky, 36, nw.; and on the Atlantic coast, Hatteras, 52, sw.; Kittyhawk, 40, sw.; Delaware Breakwater, 40, sw.; Cape May, 40, s.; Atlantic City, 28, s.; Barnegat, 29, s.; Sandy Hook, 29, sw.; New London, 28, sw.; Newport, 31, s.; Provincetown, 32, s.

HURRICANE CHART.

Chart viii. exhibits the tracks of some of the more memorable tropical hurricanes of the West Indies that have been observed since the establishment of the Signal Service. The following letter published in connection with this chart, explains the intention of the Chief Signal Officer to provide for a more extensive and elaborate system of storm warnings with respect to the tropical hurricanes which may menace our coasts:

Washington City, June 17, 1882.

Captain ————,
Commanding Steamship ————,
Care of ————.

SIR: I have the honor to inform you that the following Signal Service observers, stationed in the West India Islands, have *special* instructions to be vigilant during the hurricane season to obtain timely notice of hurricanes and telegraph the information to this service, for the benefit of the shipping interests of the north Atlantic and Gulf coasts:

Mr. A. Van Coneghan, Havana, Cuba;
Mr. ——— ———, St. Thomas, St. Thomas;
Mr. Edwin Racker, Bridgetown, Barbadoes;
Mr. Maxwell Hall, Kingston, Jamaica;
Mr. Robert Mason, Santiago de Cuba, Cuba;
Mr. L. V. Bigard, Pointe-à-Pitre, Guadeloupe.

You are also informed that the State Department has been requested to instruct its consular officers and agents, at the points named below, to telegraph promptly to the United States, notice of hurricanes, when reported to them by ship-masters:

Cienfuegos, Cuba;	Port-of-Spain, Trinidad;
Kingston, St. Vincent;	St. George, Grenada;
San Juan, Porto Rico;	Roseau, Dominica;
St. Johns, Antigua;	St. Pierre, Martinique.

The Chief Signal Officer requests, in case you encounter a hurricane or have knowledge of a hurricane then existing, that you will, on entering any of the ports before mentioned, communicate at once your information to the representative of the United States Signal Service, so that timely warning may be given, on the sea-board of the United States, of approaching danger. The information, even if several days old, may be very valuable.

The hurricane reported last August north of St. Thomas was five days in reaching the Georgia and South Carolina coasts; and the disastrous hurricane of August, 1873, was known on the 18th of August at St. Thomas, a week before the damage was done on the American coast, and on the 21st the residents of the Bermudas were fully aware of its existence, and could have foretold its track.

Thus, by timely warning from these outposts in the hurricane track, you may be the means, through the Signal Service of the United States, of averting danger and disaster; of saving life and property along our coasts; and of preventing vessels going to sea from sailing into the track of these dreadful storms.

Your co-operation is earnestly solicited in this important work. By it the Chief Signal Officer hopes to increase the efficiency of the storm-warning service along the Gulf and Atlantic coasts of the United States; in which all ship-masters, owners, agents, and underwriters have the greatest interest.

Herewith please find a chart, on which are traced the paths of some of the most prominent tropical hurricanes of the West Indies, that have prevailed since the establishment of the Signal Service of the United States.

I am, very respectfully, your obedient servant,

W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l.
Chief Signal Officer, U. S. A.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for March, 1880, and continues the series of that chart begun in January, 1877. Chart v. is prepared for June, 1880, and continues the series of that chart from November, 1877. In the description of these charts, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung," published under the direction of Prof. Dr. G. Neumayer, Director of the German Marine Observatory, and from the "Bulletin Mensuel," published by Mr. Marc. Dechrevens, of Zi-Ka-Wei, China.

Chart iv. exhibits the mean pressure, mean temperature, and prevailing direction of the wind over the northern hemisphere for the month of March, 1880, as determined from one observation taken each day at 7.35 a. m. or 0.43 p. m. Greenwich mean time.

The first area of mean low barometer appears over the eastern coast of Greenland, the mean pressure at Godthaab being 29.55, prevailing wind nne., force 4. The barometric gradient increases rapidly to the east and southeast, and very slowly in a south and southwest direction.

The second area of low barometer extends over northern Russia, and is central near Archangel, where the mean pressure for the month was 29.54, and the prevailing wind wnw., force 6.

The barometric gradient here increases rapidly to the westward and somewhat slowly to the south and eastward.

A third area of mean low pressure occupies the region of British India, where, in the central provinces, the mean pressure for the month was below 29.77.

Three areas of barometric maxima appear upon the chart, one of which extends over southeastern Siberia, where the greatest mean pressure was 30.26 at Nertschinsk. The isobar of 30.10 extends over the eastern part of Asia and includes the southernmost islands of Japan, while a second area of high pressure (30.20) covers China proper.

A third area of mean high barometer, enclosed by an isobar of 30.20 appears in Europe, over the provinces of Brandenburg and Posen and extending to Austria. The isobar of 30.10 extends from the Black Sea northwestward to the Baltic and westward to the North Sea and western coasts of Europe.

In the North America the high area of the Pacific extends over the north Pacific coast regions, where the pressure ranges from 30.11 to 30.16.

Compared with the preceding month, the barometric pressure has increased over Greenland, where the mean is .13 inch above the mean for February. The area of low barometer, then central east of Iceland, has apparently moved eastward with increasing pressure, and is now central over northern Russia, where the barometer is .21 inch below the mean for the previous month. The pressure has also decreased southward and eastward of this area, the means being about .25 inch below those for February.

In eastern Asia, the mean pressure has averaged about .3 inch below the mean for February.

In the United States, the pressure has decreased in all parts of the country, except in the lake region, where it has increased about .1 inch. The isobar of 30.20 which extended over the states of Georgia, Alabama, Tennessee, and parts of North Carolina, and Florida, is this month replaced by the isobar of 30.10.

Compared with the corresponding month of previous years, the pressure was slightly above the normal, north of latitude 35° and from the one hundreth meridian eastward to the Atlantic. In the South Atlantic and Gulf States, a slight deficiency occurred, and on the Pacific coast the pressure was about .03 inch above the normal.

The following table exhibits the mean pressure and the mean temperature for the month of March, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during March, in the years 1877, 1878, and 1879:

Countries.	Barometer.		Temperature.	
	Mean, March, 1877, 1878 and 1879	Mean, March, 1880.	Mean, March, 1877, 1878 and 1879	Mean, March, 1880.
Algeria	30.06	30.11	61.8	64.1
Austria	29.88	30.15	43.0	43.9
British Isles	29.93	30.05	44.3	48.2
Denmark	29.7	30.13	36.5	40.4
France	29.98	30.10	50.5	58.8
Germany	29.90	30.16	39.9	44.2
India	29.76	29.81	84.0	85.6
Italy	29.92	30.13	54.4	55.1
Norway	29.70	30.02	34.3	39.7
Portugal	30.07	30.07	58.6	60.3
Russia	29.83	29.93	34.2	29.7
Spain	30.05	30.08	57.6	61.8
Sweden	29.73	29.96	29.1	33.2
Turkey	29.92	30.09	54.2	50.9

The accompanying table shows the deviations in temperature and pressure at isolated stations for the month of March, 1880, as compared with the means of three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Temperature.			Mean Barometer.		
	March, 1877-78-79.	March, 1880.	Departure.	March, 1877-78-79.	March, 1880.	Departure.
	°	°	°			
York Factory	−11.1	−18.8	− 7.7	29.99	30.01	+0.02
Godthaab	20.1	16.9	− 3.2	29.72	29.95	−0.17
Stykkisholm	29.9	38.1	+ 9.2	29.65	29.69	+0.04
Tromso	28.4	28.0	- 0.4	29.54	29.78	+0.24
Thorshavn	37.7	43.9	+ 6.2	29.75	29.95	+0.20
Archangel	23.3	18.1	− 5.2	29.70	29.54	−0.16
Ekaterinburg	28.0	18.5	− 9.5	29.97	29.55	−0.42
Barnaul	23.2	24.3	+ 1.1	30.27	30.04	−0.23
Yeniseisk	22.8	23.7	+ 0.9	30.17	30.00	−0.17
Nikolaievsk on the Amoor	8.1	9.3	+ 1.2			
Zi-Ka-Wei	44.6	44.6	Normal	30.23	30.22	−0.01
Pekin	42.9	44.1	+ 1.2	30.17	30.19	+0.02
Beirut	64.8	59.7	− 5.1	29.98	29.97	−0.01
Mauritius	81.5	80.6	− 0.9	29.95	29.96	+0.01
Fort Napier	78.5	78.2	− 0.3	29.92	29.83	−0.09
Paramaribo	80.9	78.9	− 2.0	30.03	30.00	−0.03
Funchal	63.8	64.0	+ 0.2	30.15	30.13	+0.02
Ponta Delgado	60.7	60.3	− 0.4	30.25	30.10	−0.15
Bridgetown	81.5	75.6	− 5.9	29.99	30.00	+0.01
Navassa	78.4	76.4	− 2.0	30.01	30.06	+0.05
Melbourne	61.9	63.9	+ 2.0	30.00	29.88	−0.11
Hobart Town	65.1	62.1	− 3.	29.95	29.71	−0.24
Astrakhan	44.5	29.8	−14.7	29.94	29.99	+0.06
Athens	59.2	54.2	− 6.0	29.94	30.10	+0.16
Tiflis	57.4	43.9	−13.5	29.93	30.02	+0.09
Laghouat	62.1	64.9	+ 2.8	30.09	30.12	+0.03
Fort-de-France	77.4	75.0	− 2.4	29.90	30.20	+0.30
Lisbon	57.9	60.3	+ 2.4	30.08	30.10	+0.02
Sandwick Manse	39.5	42.9	+ 3.4	29.78	30.00	+0.22
Malta	60.8	59.4	- 1.4	29.97	29.98	+0.01
Gibraltar	61.2	62.4	+ 1.2	30.04	30.04	Normal
Tashkend	56 5	50.0	− 6.5	30.20	30.05	−0.15
Cape Town	77.0	76.7	- 0.3	29.99	30.01	+0.02
Angra	58.2	58.3	+ 0.1	30.24	30.09	−0.15
Cagliari	57.9	60.1	+ 2.2	29.92	30.05	+0.13
Free Town	87.6	87.3	− 0.3	29.91	29.87	−0.04
Madrid	56.5	59.9	+ 3.4	30.02	30.06	+0.04
Nukuss	56.5	45.7	−10.8	29.99	30.03	+0.04
Nassau	73.0	71.7	− 1.3	30.09	30.12	+0.03
Havana	72.6	74.2	+ 1.6	30.06	30.06	Normal
Mexico	49.2	51.3	+ 2.1	30.21	30.12	−0.09
Lahore	76.7	86.7	+10.0	29.85	29.78	−0.07
Tokei	42.5	45.1	+ 2.6	29.99	30.02	+0.03
San Juan de Puerto Rico	77.4	75.7	− 1.7	30.04	30.11	+0.07

In North America, the temperature has been above the normal, from the interior of the continent, eastward to the Atlantic, except in the New England states and Canadian maritime provinces, where it has been below the normal. At the Rocky mountain stations and on the Pacific slope, it was below the normal. The greatest excess of temperature prevailed in Florida, and the greatest deficiency was reported from the Canadian maritime provinces.

In Europe, the temperature was above the normal, except in Russia. The following are some of the extreme monthly mean temperatures reported at isolated stations:

LOWEST.	Degrees.	HIGHEST.	Degrees.
York Factory	−18.8	Freetown	87.3
Moose Factory	−4.1	Manilla	82.8
Fort Garry	−1.4	Mauritius	80.6
Nikolaievsk on the Amoor	+9.3	Paramaribo	78.9
Nertschinsk	+12.6	Navassa	76.4
Godthaab	16.9		
Archangel	18.1		
Ekaterinburg	18.5		
Barnaul	24.3		

The prevailing direction of the wind over North America was northwesterly throughout the country east of the Rocky mountains, except in Texas, Florida, and along the south Atlantic coasts, where it was generally southerly; on the north Pacific coast and in the plateau regions, southeasterly; in California and Mexico, easterly; in Canada and the maritime provinces, northwesterly.

In Europe, the prevailing direction of the wind was easterly to northeasterly, except in Denmark, Sweden, and Norway, and the west coast of Germany, where it was westerly. In Algeria, the winds were northeasterly; in Hindostan, they were generally westerly or northwesterly, and in China and Japan, northerly.

The following notes and extracts, descriptive of the meteorological conditions over Europe, for the month of March, 1880, are taken from the "Monatliche Uebersicht der Wittering:"

From the 1st to the 8th of the month, two depressions prevailed over northern Europe, and extended their influence over the greater part of Europe, excepting the southern peninsulas.

During these disturbances, the pressure increased very slowly in the northern quadrants, while in the southern quadrants the increase was very rapid, as shown by the following: On the third the pressure at Shields and at Vestervig was 28.82, and on the same day, at Rochefort and Vienna, it was 30.00. During that day stormy w.sw. winds prevailed on the coast of Germany, whereas, at Borkum, the wind was light south, with snow and rapidly falling temperature; the same conditions prevailed at Hamburg during the afternoon of the third, but toward night the wind again changed to w.sw., with greatly increased force, registering at times a velocity of seventy miles per hour.

Equally strong sw. winds occurred at all stations in north Germany, while in the southern sections of the country fresh sw. breezes, with generally clear weather prevailed. At the morning observation of the second, Liverpool and Nottingham reported light sw. wind with snow, and temperature lower than at any other stations in England.

On the morning of the eighth there was a decided change in the distribution of pressure, the barometric minima above referred to being replaced by an area of high and increasing pressure, which continued with slight changes till the end of the month.

The precipitation in Europe was generally below the normal for the month. The rainfall accompanying the storm of the first decade appears to have been excessive in the Rhine provinces where several streams overflowed, causing serious floods and delaying railroad travel. The weather during the second period of the month was unusually dry and clear.

Over the north Atlantic, west of the fiftieth meridian, and north and south of latitude 40°, during the first decade of the month, the weather was stormy, with variable winds and heavy rains.

3d: N. 26°, W. 53°, ne., force 9; heavy squalls; in N. 38°, W. 57°, n.nw., force 11; hurricane-like squalls, hail, thunder and lightning, high confused sea.

4th: In N. 39°, W. 66°, s.sw., force 10.

5th and 6th: In N. 40°, W. 62°, s.sw. 10 to n.nw. 11; lightning.

8th: In N. 39°, W. 57°, se: force 11; rainy and lightning.

10th and 11th: In N. 40°, W. 52°, s.se. to n.nw; force 11; rain and lightning, high cross sea.

Between 50° and 30° west longitude, the weather was generally stormy, with high northerly and westerly winds.

East of the thirtieth meridian, southwesterly winds prevailed, and near the coasts of Europe the weather was generally settled.

During the second and last decades of the month the weather over the ocean was generally stormy, with variable winds, mostly northwesterly, rain, snow, and hail.

Chart v. exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of June, 1880, supplemented by vessel reports from the north Atlantic.

The data received are charted for each day of the month on the charts accompanying "The International Bulletin" for that day, and from these charts and additional reports, the movement of the centres of barometric minima are traced.

Nineteen of the principal storm-areas occurring in the northern hemisphere have thus been traced.

Concerning the general distribution of these depressions, the following is given:

Nine passed over parts of the United States and Canada, five of which are traced to the Atlantic, but in two of these only, viz., numbers ii. and vi., have sufficient data been received to warrant the tracing of a continuous storm across the ocean. The depressions, with two exceptions, were generally ill defined, and exhibited but slight energy.

Four depressions are exhibited over Europe, one of which extends from the interior of Spain in a northeasterly direction, through Central Europe and southern Sweden to the eastern shores of the Gulf of Bothnia. The other, number xii., extends from southwestern France, northeastwardly to Austria. The remaining two appear over northern Europe.

Six depressions are traced in eastern Asia, extending from the coast of China, generally in a northeasterly course over the island of Niphon.

The following brief descriptions are given of the storms first appearing within the limits of the Signal Service stations:

I.—This depression appeared on the morning of the third, near Fort Benton; moving southeastward, the area was central near North Platte on the morning of the fourth. On the fifth, the depression was central near Omaha, the barometer at that station reading 29.11, or .65 inch below the normal. Moving northeastwardly, the storm was central in northern Michigan on the sixth, Escanaba barometer, 29.18. From this point, the centre passed down the Saint Lawrence valley and into the province of Quebec, with decreasing energy. During the passage of this storm very heavy rains and high winds occurred, causing serious damage to shipping on the lakes.

II.—This was apparently central off the coast of British Columbia on the morning of the seventh; following an east-southeasterly course, the centre reached Fort Buford on the eighth; thence, it passed northeastwardly into Manitoba.

III.—This depression first appeared in Colorado on the eighth, where it remained stationary until the eleventh. During that day it passed to the northeast and on the twelfth, was central near Pembina. On the thirteenth the centre was apparently near Parry Sound; barometer 29.61, and on the fourteenth it moved eastward over the Atlantic. Owing to lack of data, its subsequent movement cannot be traced. During the passage of this storm, a violent tornado occurred in Iowa, causing loss of life and great destruction of property. The storm was accompanied by heavy rain and hail.

IV.—This appeared over Nova Scotia on the twelfth, where it remained stationary until the fourteenth. On the morning of the fifteenth, the centre passed off over the Atlantic to about N. 46°, W. 52°. The following vessel reports probably indicate the further movement of this storm: sixteenth, s. s. "Erin" in N. 46°, W. 42°, moderate w. gale, head sea; schr. "Delia Hodgkins" in N. 52° 56′, W. 52° 52′, barometer, 29.69, n.ne., force 8; s. s. "Circassian" in N. 47°, W. 41°, strong w. gale, high head sea: seventeenth, s. s. "Bath City" in N. 46°, W. 42°, hard nw. gale, high sea: eighteenth, s. s. "Nederland"

in N. 44° 39′, W. 32° 33′, w., force 6, high sea: nineteenth, s. s. "City of Chester" in N. 47°, W. 31°, moderate w.nw. gale; s. s. "Pennsylvania" in 49° 27′, W. 20° 41′, barometer, 29.45, se., force 6, heavy sea: twentieth, s. s. "Braunschweig" in N. 49° 01′, W. 17° 49′, 29.46, s., force 2; s. s. "Celtic" in N. 50° 15′, W. 23° 55′, 29.62, n.e., force 4. On the twenty-first, the centre of disturbance was probably over Galway Bay, the barometer at Galway reading 29.52, calm; on the same day, the s. s. "Indiana" in N. 51° 11′, W. 16° 17′, reported, barometer, 29.55, sw. During the twenty-second and twenty-third, the depression was apparently stationary over the British Isles, where it finally disappeared.

V.—During the thirteenth, the pressure slowly decreased in Kansas, and by the morning of the fourteenth, a decided depression had formed. Moving eastward, the centre of disturbance reached West Virginia on the morning of the fifteenth; it then moved southeastward during the day and passed off the North Carolina coast, over the Atlantic. On the sixteenth, Bark "John Sheppard" in N. 34°, W. 70°, reported fresh sw. gale. This depression occasioned a violent wind and rain storm in Ohio; many buildings, bridges, etc., were destroyed by the heavy floods.

VI.—This storm developed in the St. Lawrence valley on the twenty-first, and moving slowly southeastward through Maine, was central on the twenty-second near Halifax, N. S. In connection with the passage of this area, nw. winds, ranging in velocity from twenty to forty miles per hour, were reported from various stations on the New England coast.

The following vessel reports probably indicate the eastward movement of this disturbance: twenty-third, s. s. "Nederland" in N. 40° 33′, W. 58° 42′, barometer 29.51, w.sw., force 4; bark "A. S. Taylor," in N. 35°, W. 63°, lost sails in a gale; twenty-fourth, U. S. steamer "Alliance," in N. 45° 35′, W. 53° 55′, 29.59, e.se., force 2, light rain; s. s. "Celtic," in N. 42° 36′, W. 53° 05′, 29.54, nw., force 3, heavy rain: twenty-fifth, U. S. steamer "Alliance," N. 46° 25′, W. 50° 50′, 29.49, n.n.e., force 2 to 4; s. s. "Indiana," in N. 43° 03′, W. 41° 59′, 29.63, w.sw., force 8, heavy rain: twenty-sixth, s. s. "Victoria," in N. 45° 12′, W. 37° 28′, strong breeze, head sea; s. s. "Denmark," N. 45° 22′, W. 39° 04′, strong and increasing sw. wind, high head sea; s. s. "Vaderland," N. 45° 34′, W. 37° 28′, strong s.sw. to w. breeze, rain, and high head sea: twenty-seventh, s. s. "Hibernian," N. 51° 05′, W. 34° 14′, 29.47, w.nw. This depresssion appears to have passed northeastward south of Iceland, and on the twenty-eighth, was probably central near Thorshavn, the barometer at that station reading 29.50, wind shifting from s.e to w. The disturbance continued its northerly course and on the twenty-ninth was central, with increasing pressure near Brono, barometer 29.60, wind W.

VII.—This area developed in northern Minnesota or Manitoba during the twenth-second, and on the twenty-third was central near Duluth; it passed thence over Lake Superior beyond the stations of observation. This storm was of slight energy, no winds of over twenty-five miles per hour being reported.

VIII.—This appeared in Michigan on the twenty-fourth, and moving in an easterly course the center reached the maritime provinces on the twenty-fifth. On the twenty-sixth it was central near Farther Point, and during the day passed over Cape Breton Island to the Atlantic; the bark "Ivigtut" in N. 44° 13′, W. 54° 31′, reported barometer, 29.78, s.se., drizzling.

IX.—This depression first appeared in Manitoba on the twenty-sixth. Moving slowly in an easterly direction it was central over the lakes on the morning of the twenty-eighth, and on the following day reached the province of Ontario; pursuing a northeasterly course it passed down the Saint Lawrence valley and beyond the stations of observation.

In connection with the storms occurring over Europe, some interesting notes have been taken from the "Monatliche Uebersicht der Witterung," published by Professor Dr. Geo. Neumayer, of Hamburg.

X.—The barometer was low in Spain at the beginning of the month, and on the second the depression had extended to France, and was central near Bourges. Moving in a northeasterly course, the centre of disturbance reached Berlin on the third and on the fourth passed over the Baltic to Sweden. During the fourth and fifth the centre passed near Upsala; its course then apparently changed to the eastward and passed over the Gulf of Bothnia. On the sixth it was central near Dorpat; its further movement was not sufficiently defined to admit of its being charted.

XI.—This depression apparently developed north of Scotland on the sixth, barometer at North Unst, Shetland isles, reading 29.49, a fall of .30 inch in twenty-four hours. During that day it moved in a northeasterly course towards the Norwegian coast, and on the seventh was central near Bergen. Its course then changed to the north-northeastward, with increasing pressure during the eighth, ninth and tenth, and on the latter date it disappeared over the Arctic ocean.

XII.—This first appeared in southwestern France on the tenth, and following a course slightly north of east, it reached the southwestern frontier of Germany on the twelfth; it then passed southeastward towards the Black sea, where it disappeared. In connection with this storm, a second depression probably formed, which extended its influence over central Europe, causing unusually heavy rains and thunder-st orms.

The following will be found interesting: On the twelfth, a severe thunder-storm, accompanied by heavy rain, burst over the vicinity of Hamburg; trees were uprooted and chimneys blown down. The lightning was unusually severe. In the kingdoms of Prussia and Saxony, as also in Hanover and Westphalia, the storm was equally severe, especially in the latter provinces, where several rivers overflowed, causing disastrous floods; much damage resulted from hail. At Lippstadt, in Westphalia, 137.8 m. m. or 5.425 inches of rain fell in seventeen hours; several washouts occurred on the railroads and bridges were swept away. It may be noted as interesting, that the rainfall at Lippstadt, for the first half of the month under consideration, amounted to 206.2 m. m. or 8.123 inches, while the total rainfall for the month of May was only 14.2 m. m. or 0. 55 inch.

The greatest damage to property and loss of life appear to have occurred in Saxony at and in the vincity of Zittau.

Four hundred and twenty-three dwelling-houses were almost totally wrecked, while a greater number of other buildings were more or less damaged. Reports place the damage to property at $154,500.

At Oberlausitz, sixty persons lost their lives; a large number of dwellings and other buildings were demolished or damaged. It is impossible to estimate the damage to property.

XII.—This probably developed in the Arctic, and on the seventeenth appeared near Archangel, barometer 29.63, a fall of .50 inch during twenty-four hours. Moving in a southeasterly direction, the centre of disturbance reached Kasan on the eighteenth, barometer 29.32, a fall of .62 inch. The course apparently changed to the eastward and, on the nineteenth, the depression was central near Ekaterinburg, barometer 28.94; on the twentieth, it probably disappeared in the valley of the Obi.

The following general description of the depressions traced along the coasts of China and Japan are given, together with extracts from the "Bulletin Mensuel," published by M. Marc Dechevrens of the Zi-Ka-Wei Observatory:

During the month of June, 1880, incessant rains prevailed over the interior of China; the abundant rainfall of the preceding month gave rise to grave apprehensions concerning the harvest, and during the month under consideration, these fears were realized. In addition to blighted harvests, the province of Canton has suffered severely from disastrous floods; in some instances entire villages with their total population were swept away.

The following comparison of rainfall at Hong-Kong is interesting as showing the unusual amount of precipitation during this month.

In 1877, the June rainfall was 9.37 inches; in 1878, 15.36; in 1879, 11.32, while during the same month in 1880 it reached the exceedingly large amount of 28.06 inches. As a striking contrast to the above, the monthly rainfall at Zi-Ka-Wei and northern stations was below the average, and near the fortieth parallel almost absolute drought prevailed.

In Japan the rainfall was about the average.

The depressions occurring over China and Japan during the month were only of slight energy.

XIV.—This apparently developed near Zi-Ka-Wei on the fifth, and on the sixth was probably central near Nagasaki, the barometer at that station showing a fall of .50 inch. On the seventh the area passed northeastward along the coast of Niphon, and disappeared near latitude 40°. The influence of this depression was probably felt by the ship "Sumatra" on June 7th in N. 33° 50′, E. 137° 36′, heavy se. to s. gale.

XV.—This depression appeared on the coast of China near the twenty-eighth parallel, and on the ninth was probably central over the Eastern sea, the s.s. "City of Pekin" N. 25°, 19′ E. 121° 02′, reporting barometer 29.76, ne., force 6, rainy. On the tenth the area disappeared near N. 30°, E. 130°.

XVI.—Probably developed on the fourteenth near N. 29°, E. 116°, and moved in a northeasterly course towards the straits of Corea, where it was central on the fifteenth. It continued its northeasterly course and finally disappeared on the sixteenth.

XVII.—This depression appeared northwest of Pekin on the sixteenth, the barometer at that station reading 29.58. On the seventeenth the center of disturbance was near the Gulf of Pe-Chi-Li; on the eighteenth it passed over Corea and the island of Niphon, and disappeared to the northeast on the nineteenth.

XVIII.—This moved to the eastward over China on the twenty-sixth and twenty-seventh, crossing the Gulf of Pe-Chi-Li on the twenty-eighth, when its course apparently changed slightly to the southward. It passed over the southern part of Niphon and disappeared on the twenty-ninth. The U. S. steamer "Ashuelot," in N. 33° 29′, E. 135° 58′ reported barometer 29.77, wind e.ne.

XIX.—This appeared on the twenty-ninth and moving eastward was probably central near Zi-Ka-Wei on the thirtieth, barometer 29.55, e.s.e., raining.

OCEAN ICE.

April 23d to 27th: Ship "Glory of the Seas," between N. 43° 48′ to N. 43° 00′, W. 52° 22′ passed icebergs and broken ice: 25th: S. S. "Daniel Steinmann," in N. 45° 47′, W. 43° 42′, passed a large iceberg; on the following day passed sixteen large bergs and field-ice one mile long: 27th: Bark "Pillau," in N. 43°, W. 44°, passed several large icebergs and quantities of field ice.

28th: S. S. "Polynesian," in N. 42° 56′, W. 50° 58′, passed several icebergs, and on the following day a quantity of field ice.

29th: S. S. "Pensher," in N. 46° 00′, W. 46° 30′, passed ice berg and field-ice; bark "Alaska" passed quantities of field-ice and one iceberg on southern edge of the banks.

30th: S. S "Katie," in N. 45° 09′, W. 46° 52′ passed one iceberg eighty feet high, and several smaller, and on same day in N. 44° 25′, W. 48° 30′, met large fields of ice very closely packed and stretching a distance of thirty-five miles ne. to sw.

May 1st: S. S. "Adriatic," in N. 44° 12′, W. 45° 36′, passed a large iceberg. s. s. "Jason," in N. 47°, W. 46°, met ice and remained in it for three days; passed numerous very large icebergs.

3d: S. S. "Egyptian Monarch," in N. 42° 52′, W. 48° 46′, passed three large icebergs; s. s. "Otranto," in N. 42° 24′, W. 48° 50′ passed several icebergs; s. s. "Elysia," in N. 42° 23′, W. 51° 03′, passed three small icebergs, also loose ice.

4th: S. S. "Dominion," in N. 44°, W. 45°, passed a large iceberg.

7th: S. S. "Erin," in N. 42° 42′, W. 49° 40′ to 50° 30′, passed six icebergs; s. s. "Abyssinia," in N. 42° 33′, W. 49° 51′, passed thirteen icebergs; ice was first seen in N. 42° 43′, W. 49° 51′, and last seen in N. 42° 43′, W. 50° 42′; ship "Magdalen," in N. 45° 03′, W. 45° 40′, passed fleet of large icebergs, some of very great size.

8th: S. S. "Amsterdam," in N. 43° 50′, W. 44° 30′, passed two icebergs.

9th: S. S. "Amsterdam" in N. 42° 25′, W. 50° 10′, passed several small icebergs; s. s. "City of Brussels," sighted icebergs to the nw., in N. 42°, W. 50°; s.s. "France," in N. 42° 30′, W. 51° 05′, passed thirteen icebergs; s. s. "Polino," forced through field-ice six miles broad, extending from Newfoundland to Cape Breton. Steamers report that the Cape Breton coast is blocked by ice.

10th: Telegrams from Saint John's state that there are forty-three sailing vessels, and eight steamers caught in the ice in the Gulf of Saint Lawrence; s. s. "Polaria," in N. 42° 59′, W. 46° 55′, passed a quantity of ice; ship "Magdalene" in N. 43° 09′, W. 47° 30′, passed three large icebergs.

12th: S. S. "Pieter de Conink," in N. 44° 40′, W. 44° 20′ to N. 42° 35′, W. 48° 00′, passed numerous large icebergs.

13th: S. S. "Scythia," in N. 42° 58′, W. 48° 22′ passed three icebergs; s. s. "Bavarian," in N. 42° 50′, W. 50° 00′ passed eight icebergs, all of extraordinary height and length; s.s. "Canada" between N. 44° 57′, W. 49° 48′, and N. 42° 20′, W. 51° 05′, passed several icebergs.

14th: S. S. "Castor" in N. 42° 03′, W. 50° 08′, passed numerous icebergs.

16th: S. S. "Donau" in N. 41° 41′, W. 49° 04′, passed an iceberg.

17th: S. S. "Barcelona" in N. 46° 26′, W. 43° 30′, passed numerous icebergs.

18th: S. S. "Albingia" in N. 41° 37′, W. 48° 37′, passed an iceberg; s.s. "City of Lincoln," in N. 44° 10′, W. 48° 30′, entirely surrounded by icebergs.

19th; S. S. "Bolivia," in N. 45° 35′, W. 44° 14′, passed several large and small icebergs.

19th; The s. s. "Peruvian," with one thousand passengers on board, is reported as being disabled and locked in the ice at the entrance to the Gulf of St. Lawrence; she lies in a dangerous positions and grave fears are entertained for her safety. Several vessels have been sent to her assistance.

20th: S. S. "Bolivia," in N. 43° 12′, W. 47° 46′, passed several icebergs; s. s. "Herder," in N. 41° 40′, W. 54° 23′, passed icebergs; s. s. "Strassburg," between N. 42° 31′, W. 48° 24′, and N. 42° 07′, W. 48° 51′, passed several large icebergs; s. s. "Scotland," at Montreal, twentieth, reported having been hemmed in by ice in the Gulf for nine days, and only succeeded in getting clear, by passengers and crew cutting an opening.

21st: Sch., "Harry Wetmore," (whaler) reported twenty-one ships locked in ice north of Cape Ray, also two ocean steamers between Capes Ray and Anguille; s. s. "Braunschweig," in N. 43° 45′, W. 44° 45′, passed two large icebergs; same day, in N. 43° 26′, W. 45° 00′, passed two icebergs eighty and one hundred feet high; s. s. "Nemesis," on the eastern edge of the Banks, passed thirty-six large and small icebergs.

22d: Bark "Nimbus," in N. 44°, W. 46°, sailed two hundred miles through fields of ice and passed several icebergs; s. s. "Braunschweig," in N. 41° 32′, W. 43° 34′, passed an iceberg 40 feet high; s. s. "Palestine," in N. 42° 26′, W. 50° 07′, passed two large icebergs and much field-ice; bark "Emile," in N. 43° 42′, W. 48° 36′, passed hundreds of icebergs and large icefield extending from e. ne. to w. sw.

23d: S. S. "Nevada," in N. 44°, W. 47° to N. 43°, W. 51°, passed ice; s. s. "Oder," in N. 42° 20′, W. 49° 09′ to N. 42° 04′, W. 51° 15′, passed four icebergs; s. s. "Schiedam," in N. 43° 27′, W. 44° 16′, passed several icebergs.

24th: S. S. "Egypt," in N. 41° 19′, W. 50° 44′, passed large iceberg seventy feet high; s. s. "Jan Breydel," from N. 43° 19′, W. 45° 00′ to N. 42° 16′, W. 48° 52′, passed numerous icebergs.

29th: S. S. "Gellert," in N. 41° 57′, W. 48° 33′, passed large icebergs; s. s. "Ohio," in N. 42° 50′, W. 48° 50′ to N. 42° 30′, W. 50° 31′, passed several large and small icebergs.

27th: S. S. "Batavia," between N. 42° 01′, W. 49° 15′ and N. 41° 47′, W. 51° 03′, passed several icebergs; s. s. "Caledonia," in N. 42° 38′, W. 49° 01′, passed numbers of icebergs; s. s. "Habsburg', from N. 42° 32′, W. 48° 51′ to N. 43° 24′ W. 49° 23′, passed twenty-three icebergs.

28th: S. S. "Rhynland," in N. 41° 34′, W. 48° 19′, passed large iceberg; s. s. "Sidonia," in N. 51° 40′, W. 50° 46′, passed sixty icebergs, ranging from one hundred to one hundred and fifty feet high; s. s. "Surrey," in N. 42°, W. 50°, passed several icebergs and a quantity of loose ice.

29th: S. S. "Silesia," in N. 40° 03′, W. 45° 37′, passed an iceberg; brig. "Carita," from Saint Pierre for P. E. I. arrived at Halifax after being eleven days in the ice and found it impossible to reach her destination.

30th: S. S. "City of Paris," in N. 41° 50′, W. 48° 14′, passed several icebergs; s. s. "Mosel," from N. 42° 40′, W. 49° 09′ to N. 42° 39′, W. 50° 76′, passed several icebergs; s. s. "Silesia," in N. 43° 48′, W. 53° 00′, passed twelve large icebergs.

31st: S. S. "Britannic," in N. 43° 08′, W. 46° 31′, passed small iceberg; s. s. "City of Paris," in N. 41° 37′, W. 50° 25′, passed very large iceberg; s. s. "Kansas," from N. 42°, W. 48°, to W. 50°, passed several icebergs and some field-ice.

Captain S. E. Wright, of the s. s. "Carroll," reports, May thirty-first: "Icebound in Halifax harbor since twentieth; the ice has come along the Nova Scotia shore and in sight of the harbor; such was never before witnessed by the oldest inhabitants."

TEMPERATURE OF THE AIR.

The distribution of mean temperature over the United States for the month of May, 1882, is exhibited on chart ii. by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in several districts as determined from observations taken at Signal Service stations during the month of May for previous years. The second column shows the mean temperature for the current month; the third column shows the departures of the mean of the current month from the mean of several years.

The temperature has been below the mean in all districts except in the north Pacific coast region (where it is about the normal), the greatest departures being as follows: 8°.2 in the upper Mississippi valley; 7°.4 on summit of Mount Washington; 7°.2 in the Missouri valley; 6°.6 in the Ohio valley; 6°.4 in the lower lake region; 5°.6 in New England, the upper lake region and middle slope; 5° in the extreme northwest and 4°.4 in the middle Atlantic states.

DEVIATIONS FROM MEAN TEMPERATURE.

Under this heading departures exhibited by the reports from the regular Signal Service stations are shown in the table of comparative temperatures on the left-hand side of chart ii. The following items of importance, in connection with the subject, are reported by voluntary observers:

Connecticut: Southington, mean temperature, 52°.3, or 5°.97 below the average of the past twelve years and lower than for any May during that period; the highest monthly mean, 62°.6, occurred in 1880.

Indiana: Riley, mean temperature 50°.9, or 6°.5 below the average of the past twenty-one years. Only May of 1867 was colder than that of the present year. Mean temperature of spring is 1° below the average spring mean.

Illinois: Vevay, mean temperature, 62°.4, or 3° below the average of past seventeen years. Maximum temperature, 85° is 5°.65 below the average maximum temperature, and minimum 35° is 9°.06 below the average minimum temperature of the past seventeen years.

Iowa: Clinton, mean temperature 53°.5 or 8° below the average.

Kansas: Lawrence, mean temperature 60°.27 or 6°.28 below the average of fourteen preceding years; maximum temperature for month, 90°; minimum, 36°.5; the highest maximum during the past fourteen years, 95°, occurred in 1874, '75 and '80; lowest minimum, 30°, occurred in 1875. Wellington, mean temperature 58°.2 is 10°.2 below the average of the three preceding years.

Maine: Gardiner, mean temperature 49°.26 or 4°.30 below the average of the past forty-six years, and is lower than for any May during that period; the next lowest mean, 49°.42, occurred in 1837.

Maryland: Fallston, mean temperature 55°.39 or 6°.54 below the average of the eleven preceding years. During that period the highest monthly means, 63°.16, 63°.83 and 63°.90, occurred in 1871, '72 and '81, respectively; the lowest monthly mean, 58°.68, occurred in 1877, and is 3°.29 above that of May, 1882.

Missouri: Saint Louis, Missouri Weather Service reports: mean temperature about 60°, which is more than 6° below the average of the past forty-five years. The lowest monthly means since 1837 occurred as follows: 60°.5 in 1838; 61° in 1857, and 60° in 1867.

New Hampshire: Contoocookville, mean temperature 52°.5, which is the lowest May mean that has occurred during the past eleven years, and is 4° below the average of the same period.

New York: Palermo, mean temperature 49°.8 or 5°.1 below the average of past twenty-nine years. During that period the highest monthly mean, 60°.7, occurred in 1880; the lowest, 47°.5, occurred in 1867. Waterburg, mean temperature 50°.4, or 5°.4 below the average of past eleven years. During that period the highest monthly means, 62°.6 and 62°, occurred in 1880 and '81, respectively; the lowest, 53°.1, (with the exception of that of present year) occurred in 1873. North Volney, mean temperature 50°.2, or 5°.47 below the average of past fourteen years. During that period the highest mean, 62°.43, occurred in 1880; the lowest, 52°.37, (with the exception of that of the present year) occurred in 1869. Mean temperature of spring, 40°.34, is 1°.66 below the spring average of the past fourteen years. The lowest spring mean, 38°.35, occurred in 1875; the highest spring mean, 47°.48, occurred in 1878.

Pennsylvania: Wellsboro, month the coldest that has occurred during the past ten years. The mean temperature, 50°.5, is 15°.6 below that of May, 1881. During May, 1881, only one frost occurred while fourteen occurred during May, 1882. Dyberry, mean temperature, 48°.4 is more than 2° below the mean of the coldest May that has occurred during the past twenty years, and 15° below the mean of May, 1881.

Texas: Clarksville, mean temperature of the month lower than for any May during the past thirteen years.

Vermont: Woodstock, mean temperature 50.25 or 3°.77 below the average mean of May from 1868 to 1882 inclusive. During that period the highest monthly mean, 61°17 occurred in 1880; lowest, 50°.09, occurred in 1873; maximum temperature, 96°.3, occurred May 26, 1880; minimum, 22°.4 occurred May, 7th, 1874.

Virginia: Wytheville, mean temperature, 57°.86 or 3°.9 below the average of past nineteen years. The highest monthly mean, 66° occurred in 1880; lowest, 50°, occurred in 1866. The highest temperature reached during the month, 83°, has been equalled or exceeded thirteen times during the past nineteen years, while the minimum temperature, 32°, is the lowest, with the exception of two years, for the same period.

West Virginia: Helvetia, mean temperature, 56°.95 or 1°.54 below the average of the past six years.

RANGES OF TEMPERATURE AT SIGNAL SERVICE STATIONS.

Monthly ranges of temperature during the month of May varied from 22° to 68° at stations east of the Rocky mountains, and from 25° to 65° at stations on the Pacific coast. The smallest ranges are: Key West, 22°; Galveston and San Diego, 25°; Port Eads, Louisiana, and Punta Rassa, Florida, 26°; Brownsville, Texas, 28°; San Francisco, 29°; Indianola and New Orleans 30°; Pike's Peak, Colorado, and Portsmouth,

Table of Comparative Maximum Temperatures for the Month of May.

State or Territory.	Maximum for May, 1882, Signal Service.		Highest since Signal Service stations were opened—3 to 11 years.			Highest from any other source.			
	Station	Temp.	Station.	Temp.	Year.	Place.	Temp.	Year	Length of Record.
		°		°			°		
Alabama	Mobile	92	Montgomery	98	1875	Mount Vernon Arsenal	102		34 years.
Do			Mobile	98	1878				
Arizona	Yuma	104	Maricopa Wells	106	1876	Camp Verde	111		12 "
Do	Phœnix	102	Tucson	106	1881	Fort Mojave	110		11 "
Arkansas	Little Rock	87	Little Rock	91	1880	Washington, near	94		28 "
Do						Fort Smith	93		21 "
California	Visalia	101	Los Angeles	97	'79 & '80	Fort Miller	113		14 "
Do			Visalia	97	'78 & '79				
Do			Red Bluff	97	1878				
Colorado	West Las Animas	85	Denver	92	1874	Fort Lyon	99	1880	22 "
Connecticut	New Haven	76	New Haven	89	1880	New Haven	93		86 "
Do			New London	89	1881				
Dakota	Rapid City	89	Fort Sully	101	1874	Fort Abercrombie	102		19 "
Do	Yankton	88	Pembina	96	1874	Fort Randall	101		22 "
Do						Fort Sully	101		16 "
Delaware	Delaware Breakwater	76	Delaware Breakwater	89	1880	Dover	94	1880	7 "
Do						Fort Delaware	91		45 "
Dist. of Columbia	Washington	86	Washington	96	1880	Washington	96		59 "
Florida	Key West	91	Jacksonville	98	'74 & '78	Houston	100	'78 & '81	4 "
Do			Saint Marks	97	1874	Okahumpka	99	1879	4 "
Do						Fort King	98		10 "
Georgia	Savannah	91	Augusta	100	1875	Oglethorpe Barracks	97	1878	40 "
Do			Tybee Island	99	1878	Quitman	97	1876	4 "
Do						Augusta Arsenal	96		51 "
Idaho	Lewiston	88	Lewiston	88	1879	Fort Lapwai	101		18 "
Do			Boise City	88	1881				
Illinois	Cairo	83	Cairo	92	1874	Chicago	98		38 "
Do						Mattoon	98	1876	2 "
Indiana	Indianapolis	80	Indianapolis	89	'74 & '81	Logansport	99	1881	2 "
Do						Vevay	98		13 "
Indian Territory	Fort Gibson	88	Fort Sill	97	1880	Fort Arbuckle	100		20 "
Do			Fort Gibson	94	'74 & '80	Fort Gibson	99		47 "
Do						Fort Sill	98	1875	9 "
Iowa	Des Moines	83	Dubuque	94	1874	Boonsboro	96	1880	4 "
Do			Des Moines	93	1880	Nora Springs	96	1876	6 "
Do						Glenwood	96	1880	1 "
Kansas	Leavenworth	89	Dodge City	98	'79 & '80	Fort Hays	100	1879	12 "
Do			Leavenworth	94	'74 & '75	Fort Larned	99		18 "
Do						Fort Riley	99		23 "
Kentucky	Louisville	85	Louisville	93	1881	Newport Barracks	90		29 "
Do						Bowling Green	90	1880	3 "
Do						Chilesburg	90		4 "
Louisiana	Shreveport	93	Shreveport	101	1875	Baton Rouge	99		56 "
Maine	Portland	72	Portland	94	1880	Brunswick	98		53 "
Maryland	Baltimore	83	Baltimore	95	1881	Fort Washington	97		38 "
Do						New Market	98	1877	3 "
Massachusetts	Boston	81	Boston	80	1881	Somerset	97	1880	7 "
Do						Williamstown	95		60 "
Michigan	Grand Haven	76	Marquette	95	1874	Detroit	94		38 "
Do						Ontonagon	94		11 "
Minnesota	Saint Paul	77	Saint Paul	94	1874	Fort Ripley	101		16 "
Mississippi	Vicksburg	90	Vicksburg	95	'74 & '77	Brookhaven	98	1875	5 "
Missouri	Saint Louis	89	Saint Louis	93	1874	Corning	100	1875	7 "
Do						Saint Louis	97	1878	40 "
Montana	Cartersville	91	Fort Keogh	98	1881	Fort Shaw	98		13 "
Nebraska	North Platte	87	North Platte	94	1880	Fort McPherson	100	1879	12 "
Do						Fort Calhoun	98		5 "
Nevada	Winnemucca	86	Winnemucca	86	1881	Camp Halleck	104		11 "
New Hampshire	Mount Washington	46	Mount Washington	62	'79 & '80	Auburn	96	1881	5 "
Do						Grafton	96	1880	2 "
New Jersey	Little Egg Harbor	83	Sandy Hook	89	1874	New Lisbon	101	1880	1 "
Do						New Brunswick	98	1880	5 "
New Mexico	La Mesilla	95	La Mesilla	101	'79 & '81	Fort McRae	109		11 "
Do						Fort Craig	108		25 "
New York	Albany	79	New York City	94	1880	West Point	101	1880	55 "
Do			Oswego	94	1879	Newberg	98		40 "
North Carolina	Kitty Hawk	87	North Carolina	95	1878	Weldon	100	1880	7 "
Do						Fort Johnson	92		57 "
Ohio	Cincinnati	83	Cincinnati	94	'74 & '75	Cincinnati	96	'77 & '81	42 "
Do						Marietta	94		53 "
Oregon	Umatilla	96	Umatilla	92	1878	Fort Dalles	96		15 "
Pennsylvania	Pittsburgh	82	Philadelphia	96	1880	Philadelphia	98	1880	120 "
Do			Pittsburgh	95	1881	Milton	100	1881	2 "
Rhode Island	Newport	75	Newport	85	1881	Fort Adams	91	1880	40 "
Do						Providence	91		35 "
South Carolina	Charleston	87	Charleston	94	1878	Charleston	94		105 "
Do						Aiken	97	1881	6 "
Tennessee	Memphis	90	Memphis	96	1879	Humboldt	98		4 "
Do						Ashwood	96	1879	3 "
Texas	Eagle Pass	105	Eagle Pass	116	1879	Ringgold Barracks	123	1879	32 "
Do			Uvalde	113	1879	Camp Stockton	111		15 "
Utah	Salt Lake City	83	Salt Lake City	91	1874	Camp Douglass	91		16 "
Do						Mount Carmel	96.4	1876	3 "
Vermont			Burlington	91	1880	Charlotte	96	1878	7 "
Do						Lunenburgh	88		16 "
Virginia	Norfolk	89	Norfolk	98	1880	Accotink	97	'80 & '81	6 "
Do						Alexandria	96		12 "
Do						Fortress Monroe	95	1880	55 "
Washington T'y	Dayton and Pomeroy	86	Dayton	90	1880	Fort Walla Walla	99		14 "
West Virginia	Morgantown	79	Morgantown	91	1875	Weston	100	1877	2 "
Do						Helvetia	90	1877	5 "
Wisconsin	La Crosse	80	La Crosse	96	1874	Embarrass	98		14 "
Wyoming	Cheyenne and Fort Washakie	77	Cheyenne	88	1874	Fort Laramie	98		27 "

North Carolina, 31°; Fredericksburg, Texas, and New Shoreham, Rhode Island, 33°; Hatteras, North Carolina, Delaware Breakwater, Delaware, and Pensacola, Florida, 34°; Thatcher's Island, Massachusetts, and Macon, North Carolina, 35°. The largest are: Deer Lodge, Montana, 69°; Cartersville, Montana, 66°; Campo, California, 65; Missoula and Terry's Landing,

Montana, and Winnemucca, Nevada, 63°; Rapid City, Dakota, and Umatilla, Oregon, 62; Red Bluff, California, and New Chicago, Montana, 59°; Grierson Springs, Texas, and Visalia, California, 58°; El Paso, Texas, Fort Buford, Dakota, and San Carlos, Arizona, 57°; Dayton, Washington Territory, Eagle Rock, Idaho, and Fort Stevenson, Dak., 56°; Saint Vincent, Minnesota, Fort Keogh, Montana, Couer D'Alene, Idaho, La Mesilla, New Mexico, and Sacramento, California, 55°. The greatest *daily* ranges varied in different districts, as follows: New England, from 18° at New Shoreham on the 9th, and 20° at Mount Washington on the 2d, to 32° at Boston on the 8th, and 34° at Springfield on the 4th; middle Atlantic states, from 21° at Cape May on the 3rd and 19th, and 23° at Delaware Breakwater on 9th to 34° at Atlantic City on the 9th, and 45° at Norfolk on the 20th, and Williamsport, Pennsylvania, on the 3rd and 30th; south Atlantic states, from 20° at Jacksonville, on the 2nd and 21st, to 27° at Charlotte on the 19th, and 28° at Wilmington on the 4th; Florida peninsula, from 14° at Key West on the 1st, to 25° at Cedar Keys on the 18th; east Gulf states, from 18° at New Orleans on the 24th, to 30° at Mobile and 31° at Montgomery on the 4th; west Gulf states, from 18° at Port Eads on the 3d, and 19° at Galveston on the 8th, to 33° at San Antonio on the 10th, and 36° at Fort Gibson, on the 1st; Rio Grande valley, from 23° at Brownsville on the 12th to 44° at Eagle Pass on the 10th and 47° at Uvalde on the 12th; Ohio valley and Tennessee, from 26° at Indianoplis on the 7th and 17th, and at Columbus on the 17th to 37° at Morgantown on the 3d; lower lake region, from 22° at Erie on the 3d and 31st; to 30° at Cleveland on the 3d; upper lake region, from 24° at Milwaukee on the 25th, to 35° at Alpena on the 3d, and 36° at Duluth on the 29th; extreme northwest from 34° at Saint Vincent on 14th and 28th, to 41° at Bismarck on the 2d; upper Mississippi valley, from 23° at Cairo on the 25th, and 24° at Springfield, Illinois, on 26th, to 32° at Saint Paul on 15th and 16th, and at Des Moines on 2d, and 16th; Missouri valley, from 26° at Springfield, Missouri, on the 17th, and at Leavenworth on the 15th, 16th, 17th, and 22d, to 41° at Fort Bennett, Dakota, on the 3d; northern slope, from 31° at Helena, Montana, on the 1st, 11th, and 24th, and at North Platte, Nebraska, on the 1st, to 62° at Rapid City, Dakota, and 63° at Terry's Landing, Montana, on 2d; Middle slope, from 18° at Pike's Peak on the 16th, to 36° at Fort Elliott, Texas, on the 1st, and 40° at West Las Animas, Colorado, on the 3d; southern slope, from 31° at Henrietta, Texas, on the 23d, to 43° at Fort McKavett, Texas, on the 11th, and 50° at El Paso, Texas on the 12th; southern plateau, from 36° at Fort Grant, Arizona, on the 4th, to 50° at Tucson, 51° at Fort Apache, Arizona, and 52° at La Mesilla, New Mexico on the 11th; middle plateau, from 33° at Salt Lake City on the 1st, and 34° at Pioche, Nevada, on the 22d, to 42° at Winnemucca on the 10th, and 11th; northern plateau, 38° at Spokane Falls, on the 24th, and 39° at Boise City, on the 11th, to 49° at Missoula, Montana, on the 12th; north Pacific coast region, from 33° at Portland on the 23d, to 44° at Roseburg on the 21st; middle Pacific coast region, from 20° at San Francisco on the 9th and 20th, to 34° at Red Bluff on the 31st; south Pacific coast region, from 23° at San Diego on the 10th, to 54° at Campo on the 11th.

FROSTS.

In the various districts they were reported on the following dates:

New England: 1st to 8th, 11th, 15th to 18th, 24th, 26th, 30th.

Middle Atlantic states: 1st to 8th, 11th, 12th, 16th to 20th, 24th, 26th, 30th.

Tennessee: 1st, 16th, 17th, 23d.

Ohio valley: 1st to 4th, 6th, 15th to 18th, 23d, 24th, 26th, 29th.

Lower lake region: 1st, 2d, 3d, 5th to 8th, 10th, 15thto 18th, 23d, 24th, 27th, 28th, 30th.

Upper lake region: 1st to 7th, 14th to 18th, 22d to 25th, 27th, 28th, 29th, 31st.

Extreme northwest: 1st, 2d, 6th, 11th, 21st, 22d, 23d, 26th, 28th, 29th, 31st.

Upper Mississippi valley: 1st, 2d, 11th, 12th, 15th, 16th, 17th, 21st to 25th, 29th.

Missouri valley: 1st, 9th, 13th, 16th, 21st, 22d, 23d, 25th.

Northern slope: 8th to 24th, 31st.

Middle slope: 1st, 2d, 5th to 10th, 19th, 20th, 22d, 25th, 30th, 31st.

Northern plateau: 9th, 10th, 13th, 14th, 20th.

Middle plateau: 5th, 8th, 9th, 10th, 13th to 18th, 20th, 21st.

North Pacific coast region: 8th, 9th, 11th, 13th, 15th, 19th, 20th.

Middle Pacific coast region: 13th to 16th, 22d, 23d, 24th.

South Pacific coast region: 4th, 9th, 12th, 15th, 16th, 17th.

The occurrence of frosts have also been reported by the following stations not situated in the districts named above: Highlands, N. C., 1st, 23d; Lenoir, N. C., 1st; Augusta, Ga., 16th, 17th; Green Springs, Ala., 16th, 17th; Santa Fe, 7th, 9th, 10th, 22d, 28th.

Damaging frosts have been reported in the various states and territories as follows:

Illinois: Rockford, 23d, the frost nipped the fruit buds, but it is thought that the damage will be light. Anna, 16th, injuring early vegetables. Champaign, 16th, injuring fruit and vegetables. Springfield, 22d, the cold northwesterly winds of early morning seriously injured fruit and vegetables.

Iowa: Nora Springs, 22d and 23d, killing corn, potatoes, and other vegetables, also injuring the foliage of fruit and forest trees. Cresco, 22d, killing vegetation. Dubuque, 22d, considerable damage done by frost; cherries and plums ruined; apples injured; 23d, all advanced garden vegetables seriously injured. Des Moines, 22d, it is reported from surrounding country that the frost of last night has done much damage. At Ames, the frost is reported to have been the heaviest known at this season for many years; corn and potatoes have been seriously injured, and the foliage of many forest trees has been discolored from its effects. At Fort Dodge, the heavy frost is believed to have killed all the fruit; corn and potatoes were killed in the ground. At Marshalltown, small fruits are mostly ruined and other damage is feared.

Kansas: Atchison, garden vegetables are cut badly, but no further damage has been sustained. Clay Centre, garden vegetables were slightly injured, other crops suffered no injury; Emporia, tender vegetables on the bottom lands suffered some damage. The frost of the twenty-second is the first that has occurred at so late a date for many years. Holton, 22d, killing potatoes and all tender vegetation.

Minnesota: Minneapolis, 23d: the frost nipped the fruit buds and early garden truck, but did no further damage.

Missouri: Kansas City, 22d, reports state that small fruits have suffered greatly, and that in some districts the crop will be a failure. Rich Hill, 22d, some damage was done to vegetation on low bottoms; wheat and fruit were not injured.

Michigan: Port Huron, 24th, much damage reported to have been done to the fruit crop in this section.

Nevada: Carson City, 15th, nearly all fruit frozen.

New Jersey: Atco, 3d, doing much injury. Moorestown, 3d, very severe, killing vegetation.

North Carolina: Lenoir, 1st, frost injuring cotton. Weldon, 22d, the cold weather has killed cotton; farmers are plowing up the fields and replanting them.

Ohio: College Hill, 11th, peaches, pears, cherries, and quince destroyed. Toledo, 24th, much injury done in adjacent country by frosts; beans and peas were entirely destroyed and wheat was damaged to some extent.

Tennessee: Memphis, 17th, strawberry crop injured. Chattanooga, 19th, the effects of the recent cold weather upon cotton has been very injurious. Many farmers have plowed up their fields and replanted them with corn.

Table of Maximum and Minimum Temperatures for May, 1882.

State or Territory.	Signal Service. Station.	Max.	Min.	U. S. Army Post Surgeons or Voluntary Observers. Station.	Max.	Min.
		°	°		°	°
Alabama	Mobile	92		Calera	97	36
Do	Montgomery		48			
Arizona	Yuma	104				
Do	Phœnix	102				
Do	Fort Apache		32			
Arkansas	Little Rock	87	49	Madison	92	28
Do				Brinkley and Devall's Bluff	92	
California	Visalia	101		Borden	111	
Do	Campo		30	Cisco and Emigrant Gap		24
Colorado	West Las Animas	85		Fort Lyon	88	
Do	Denver		34	Fort Lewis		22
Do	Pike's Peak	35	4			
Connecticut	New Haven	76	31	Southington	85	
Dakota	Rapid City	89		Fort Randall	91	
Do	Yankton	88		Fort Yates		18
Do	Fort Buford		22			
Delaware	Del. Breakwater	76	42			
District of Columbia	Washington	86	37			
Florida	Key West	91		Ft. Brook Tampa	95	
Do	Pensacola		52	Live Oak		46
Georgia	Savannah	91		Way Cross	98	
Do	Atlanta		45	Madison		31
Idaho	Lewiston	88				
Do	Eagle Rock		24			
Illinois	Cairo	83		Charleston	87	
Do	Champaign		33	Riley		27
Indiana	Indianapolis	80	37	Logansport	90	32
Indian Territory	*Fort Gibson	88	41			
Iowa	Des Moines	83		Guttenburg and Nora Springs		24
Do	Dubuque		31			
Kansas	Leavenworth	89		Clay Centre	96	
Do	Dodge City		39	Wellington		34
Kentucky	Louisville	85	44	Bowling Green	84	32
Louisiana	Shreveport	93	49	Cheneyville	108	
Do				Franklin		34
Maine	Portland	72		Fort Preble	77	
Do	Eastport		29	Gardiner		28
Maryland	Baltimore	83	38	Emmittsburg	87	
Do				Woodstock		29
Massachusetts	Boston	81	31	Westborough	83	
Do				Heath		26
Michigan	Grand Haven	76		Hastings	83	20
Do	Escanaba		29			
Minnesota	St. Paul	77		Minneapolis	79	
Do	St. Vincent		22			
Mississippi	Vicksburg	90		Waynesborough	100	41
Do	Starkville		50	Lake		41
Missouri	Saint Louis	89		Jefferson Barracks		34
Do	Springfield		41			
Montana	Cartersville	91				
Do	Deer Lodge		21			
Nebraska	North Platte	87	33	De Soto	89	
Do					92	
Nevada	Winnemucca	86	23	Humboldt		
New Hampshire	Mt. Washington	46	4	Contoocookville	80	
				Grafton and New Market		30
New Jersey	Little Egg Harbor	83		Readington	88	
Do	Atlantic City and Cape May		34	Atco		28
New Mexico	La Mesilla	95		Deming	97	
Do	Santa Fe		32	Fort Union		23
New York	Albany	79		Troy and West Point	88	
Do	Rochester		29	Johnstown		24
North Carolina	Kittyhawk	87		Wadesboro	94	
Do	Smithville		43	Goldsboro		34
Ohio	Cincinnati	83		North Lewisburg and New Athens		30
Do	Cleveland		31			
Oregon	Umatilla	96	34			
Do	Roseburg		34			
Pennsylvania	Pittsburg	82		Fallington	83	
Do				Dyberry		20
Do	Erie and Williamsport		32			
Rhode Island	Newport	75		Fort Adams	70	33
Do	Narragansett Pier		34			
South Carolina	Charleston	87	52	Allendale, Cheraw, Hardwell, and King's Tree	94	
Do				Florence		32
Tennessee	Memphis	90		Milan and Withe	92	
Do	Knoxville		41	Erin		36
Texas	Eagle Pass	105				
Do	Fort Elliott		31			
Utah	Salt Lake City	83	38	Coalville	77	27
Vermont				Woodstock	81	28
Virginia	Norfolk	89		Snowville	88	32
Do	Cape Henry			Accotink	88	
Do	Chincoteague and Lynchburg		42	Wytheville		32
Washington Ter	Dayton	86	30			
Do	Pomeroy	86				
Do	Olympia		30			
West Virginia	Morgantown	79	31	Helvetia	84	30
Wisconsin	La Crosse	80		Beloit	81	
Do	Milwaukee		31	Embarrass		30
Wyoming	Cheyenne	77	23	Fort Bridger		19
Do	Fort Washakie	77				

* Observations from 1st to 12th

ICE.

The formation of ice has been reported in the various states and territories as follows:

Connecticut: Southington, 6th, 7th, 16th.

Dakota: Alexandria, 21st, 22d.

Idaho: Eagle Rock, 17th.

Illinois: Rockford, 15th; Charleston, 2d.

Indiana: Logansport, 2d; Wabash, 15th, 16th; Fort Wayne, 1st, 23d, 24th.

Iowa: Davenport, Clinton, Muscatine and Nora Springs, 2d; Cresco, 22d, 23d; Fort Madison, 23d; Guttenburg, 22d, 30th; Independence, 21st, 22d; Dubuque, 23d.

Michigan: Detroit and Grand Haven, 2d.

Minnesota: Saint Paul, 2d, 23d.

Nebraska: Genoa, 1st, 21st.

Nevada: Carson City, 5th, 8th, 9th, 10th, 13th, 14th, 15th, 17th, 20th, 21st.

New York: Friendship, 16th, 18th, 26th. Waterburg, 3d, 6th, 7th 16th, 18th, 19th. Albany, 3d.

Ohio: Bellefontaine, 1st, 2d, 3d. Cleveland, 3d. Jacksonburg, 3rd, 16th. North Lewisburg, 3d. Westerville, 1st, 3d. Toledo and Cleveland, 3d.

Pennsylvania: Fallsington, 3d.

Vermont: Charlotte, 16th. Strafford, 5th, 6th, 7th, 16th. Woodstock, 3d, 6th, 16th, 26th.

Wisconsin: Embarrass, 2d, 15th. La Crosse, 16th, 23d.

Wyoming: Fort Washakie, 19th.

PRECIPITATION.

The distribution of rainfall over the United States and Canada, as determined from observations taken at over six hundred stations, is exhibited on chart iii. The table on the left-hand corner of this chart, shows the average monthly rainfall determined from the records of Signal Service stations, in the several districts, and the excess or deficiency as compared with the average of many years. Large excesses occurred in the middle Atlantic and west Gulf states, in the Ohio valley, Tennessee, the lower lake region, and Rio Grande valley; the departures ranging from 2.00 inches in the Rio Grande valley, to 4.57 inches in the Ohio valley. On the summit of Mount Washington, an excess of 2.77 inches, and on the summit of Pike's Peak, an excess of 9.08 inches occurred. The largest deficiency occurred in the south Atlantic states, where it amounted to 1.28 inches. In the northern plateau district, a deficiency of 1.12 inches, and in the north Pacific coast region a deficiency of 0.87 inch occurred, and a slight deficiency is reported from the south Pacific coast region.

DEVIATIONS FROM AVERAGE PRECIPITATION.

Under this heading departures exhibited by the reports from the regular Signal Service stations, are shown in the table of comparative monthly rainfalls (as published in the lower left-hand corner of chart iii.) The following items of importance in connection with this subject are reported by voluntary observers.

Illinois: Riley, monthly rainfall 3.59 inches, or 0.27 inch more than the average of the past twenty-one years. The total precipitation for the spring of 1882, is 2.83 inches more than the spring average of the past twenty-one years, and has been exceeded in but two years during that period; viz.: in 1861 and 1868.

Indiana: Vevay, monthly rainfall 8.65, or 5.12 inches more than the average of the past seventeen years. Laconia, monthly rainfall 7.86 inches, which is the largest May rainfall that has occurred since 1868, when 8.08 inches fell.

Kansas: Wellington, monthly rainfall 7.20, or 2.20 inches more than the average of the past three years. During that period, the largest May rainfall, 9.37 inches, occurred in 1881; the smallest, 1.16, inches occurred in 1879. Total rainfall for the five months ending May 31st, is 13.47; for the same period in 1881, 14.52; in 1880, 6.78 and in 1879, 6.56 inches. Lawrence, monthly rainfall 3.53 inches, or 0.57 inch below the average of the past four-

teen years. Total precipitation for the five months ending May 31st is 10.71 inches, which is 1.19 inches below the average of the same period for the past fourteen years.

Maine: Gardiner, monthly rainfall 4.74 inches, or 0.66 inch more than the average of past forty-six years.

Maryland: Fallston, monthly rainfall 3.76 inches, or 0.76 inch more than the average of the eleven preceding years. During that period the largest May rainfall, 6.47 inches, occurred in 1873; the smallest, 0.70 inch, occurred in 1875.

Missouri: Saint Louis, Missouri Weather Service reports a slight deficiency in the rainfall for the month, as compared with the average of the past forty-five years.

New Hampshire: Contoocookville, monthly rainfall 4.25 inches, or 1.00 more than the May average of the past eleven years.

New York: Palermo, monthly rainfall, 2.53 inches, which is about the May average for the past twenty-three years. During that period the largest May rainfall, 6.90 inches, occurred in 1867; the smallest, 0.30 inch, occurred in 1870. Waterburg, monthly rainfall, 4.70, or 2.42 inches more than the May average of the past ten years. During that period the largest May rainfall, 4.65 inches (with the exception of May, 1882), occurred in 1881; the smallest, 0.52 inch, occurred in 1879. North Volney, monthly rainfall, 3.55, or 1.54 inches more than the May average of the nine preceding years. During that period the largest May rainfall, 3.15 inches (with the exception of the current year), occurred in 1878; the smallest, 1.10 inches, occurred in 1876. Total rainfall for spring, 8.47 inches, or 0.97 inch more than the spring average of the past nine years.

Virginia: Wytheville, monthly rainfall, 4.45 inches, or 1.00 inch more than the May average of past nineteen years. Total precipitation for the five months ending May 31st is 5.00 inches in excess of the average for the same period for the past nineteen years.

West Virginia:—Helvetia, monthly rainfall, 7.15, or 3.18 inches more than the May average of the past six years.

The following table, furnished by Dr. W. W. Hays, of San Luis Obispo, Cal., shows the monthly and annual precipitation at that place during the past twelve years. The station is situated in the county of the same name, about ten miles from the Pacific coast and about two hundred miles southeast of San Francisco.

Rainfall at San Luis Obispo during the Past Twelve Years.

[MEASURED BY DR. W. W. HAYS.]

Year.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	M'ch	April	May.	June	July.	Tot'l
1869-70	.....	.....	.84	.66	.78	.71	4.85	.74	2.40	.85	.....	.....	11.83
1870-71	.....	.....	.68	.38	2.90	1.51	4.43	.....	2.79	.28	.....	.....	12.97
1871-72	.....	.....	.....	2.40	13.93	5.16	3.45	.71	1.37	.....	.....	.....	27.02
1872-73	.....	.....	.....	.....	6.00	5.00	1.79	.....	.....	.....	.....	.....	12.79
1873-74	.....	.....	.....	.....	7.96	4.29	4.04	3.23	1.00	.....	.....	.....	20.52
1874-75	.....	.....	4.28	2.05	.48	12.10	.28	.50	.....	.....	.....	.....	19.69
1875-76	.....	.....	.....	6.20	2.20	9.87	5.29	5.30	1.26	.....	.....	.....	30.12
1876-77	.....	.....	1.16	.....	.....	4.83	.42	1.74	.....	.....	.....	.....	8.15
1877-78	.....	.....	.....	1.42	3.90	7.88	11.91	2.74	2.75	.....	.....	.....	30.60
1878-79	.....	.....	.....	1.50	2.58	1.78	2.15	1.60	1.80	.25	.....	.....	11.66
1879-80	.....	.....	.75	1.40	3.03	1.75	7.23	2.36	8.78	.52	.....	.....	25.82
1880-81	.....	.....	.....	.48	13.35	4.71	1.90	1.40	1.85	.....	.....	.....	23.69
1881-82	.....	.40	1.65	.25	2.00	.85	3.40	6.75	1.73	.....	.....	.....	17.03

Table of Special Heavy, Largest and Smallest Monthly Rainfalls.

STATION.	Special Heavy.			Largest Monthly.	Smallest Monthly.	
	Date.	Amt.	Duration	Amount, Inches.	STATION.	Amt.
		inch.				in's.
Alabama.					*Arizona.*	
Mt. Vernon Barracks	8	4.06	.....	8.57	Phoenix	0.00
do.	21	3.01	.....	.....	Yuma	0.00
Calera	8	4.00	.....	7.78	Casa Grande	0.00
State Line	11	3.04	.....	7.18	Maricopa	0.00
Arkansas.					Pantano	0.00
Malvern Junction	6 and 7	5.79	.....	17.36	Bensons	0.00
do.	9	8.26	.....	.....	Wilcox	0.00
Little Rock	7	4.14	.....	15.91	Tucson	0.01
do.	9	6.33	.....	.....	Fort Verde	0.19
Walnut Ridge	8 and 9	8.40	.....	14.30	Fort Grant	0.33
Mount Ida	8 and 9	3.70	25 hrs.	12.45	Prescott	0.45
do.	10	1.20	10 min.	.....	Camp Thomas	0.47

Table of Special Heavy, Largest and Smallest Monthly Rainfalls—Continued

STATION.	Special Heavy.			Largest Monthly.	Smallest Monthly.	
	Date.	Amt.	Duration	Amount, Inches.	STATION.	Amt.
Fort Madison	.....	.....	.....	10.50	*California.*	
Prescott	9	5.04	.....	9.43	Brighton	0.00
Madison	9	2.70	.....	8.27	Lathrop	0.00
Arkansas City	10	3.10	.....	7.61	Stockton	0.00
Russelville	8 and 9	4.79	.....	7.14	Rocklin	0.00
Fort Smith	7	2.73	.....	.....	Marysville	0.00
Colorado.					Chico	0.00
Pike's Peak	7	3.40	.....	12.34	Turlock	0.00
do.	8 and 9	3.31	.....	.....	Dunnigan	0.00
Florida.					Willows	0.00
Key West	26	2.89	.....	7.46	Byron	0.00
Georgia.					Davis	0.00
Way Cross	8	2.93	.....	.....	Napa	0.00
Illinois.					Woodland	0.00
Springfield	5	3.35	.....	10.59	Mojave	0.00
Cairo	9	4.24	.....	10.22	Newhall	0.00
Anna	.....	.....	.....	9.77	Spadra	0.00
Champaign	.....	.....	.....	8.55	Colton	0.00
Indiana.					Indio	0.00
New Corydon	.....	.....	.....	11.34	Mammoth Tank	0.00
Saint Meinrad	.....	.....	.....	9.23	Antioch	t'ce
Vevay	27 and 28	3.15	8 hrs.	8.65	Brentwood	"
Laconia	.....	.....	.....	7.86	Alcatraz Island	0.02
Lafayette	.....	.....	.....	7.80	Poway	0.04
Indianapolis	.....	.....	.....	7.65	Tehama	0.05
New Harmony	9	2.74	.....	.....	Williams	0.05
Rising Sun	28 and 29	2.25	6 hrs.	.....	Kingsburg	0.08
Iowa.					Lemoore	0.08
Cedar Rapids	5	3.25	.....	9.13	Fresno	0.10
Des Moines	4 and 5	2.81	.....	8.53	Rio Vista	0.10
Muscatine	.....	.....	.....	8.36	San Fernando	0.10
Keokuk	.....	.....	.....	7.11	Farmington	0.13
Fort Madison	5	3.30	.....	.....	Suisun	0.14
Kansas.					Galt	0.15
Argyle	.....	.....	.....	11.02	Oakland	0.15
Winfield	.....	.....	.....	9.70	Knight's Landing	0.16
Clay Centre	26 and 27	6.02	.....	9.37	Point San Jose	0.16
Oxford	.....	.....	.....	8.16	Calistoga	0.17
Salt City	.....	.....	.....	8.16	Martinez	0.17
Belle Plain	.....	.....	.....	8.10	Campo	0.18
Rolling Green	.....	.....	.....	8.01	San Diego	0.18
Wellington	.....	.....	.....	7.20	Angel Island	0.19
Caldwell	.....	.....	.....	7.00	Tehachapi	0.20
Clay Centre	24	1.90	1hr.40m.	.....	San Francisco	0.21
Kentucky.					Goshen	0.23
Bowling Green	.....	.....	.....	8.65	South Vallejo	0.25
Louisville	.....	.....	.....	7.46	Ione	0.27
Paducah	9	4.30	.....	.....	Princeton	0.28
Louisiana.					Brighton	0.31
Amiti City	.....	.....	.....	8.11	Petaluma	0.31
Cheneyville	7	3.00	.....	7.65	Merced	0.32
Whiteville	7	2.55	.....	.....	Red Bluff	0.33
Monroe	7	3.14	.....	.....	Sacramento	0.35
New Iberia	21	2.82	.....	.....	Visalia	0.37
Maryland.					Tracy	0.40
Emmittsburg	28	2.50	2hrs.15m.	.....	Anaheim	0.40
Massachusetts.					Niles	0.45
Thatcher's Island	.....	.....	.....	8.72	Pleasanton	0.48
Michigan.					Salinas City	0.49
Coldwater	27	3.10	.....	8.12	Delano	0.50
Northport	30 and 31	2.75	.....	7.50	Tulare	0.50
Minnesota.					Modesto	0.50
Duluth	28	2.58	.....	7.14	*Colorado.*	
Mississippi.					Hermosa	0.39
Hernando	10	4.44	.....	9.60	Pagosa Springs	0.50
Vicksburg	7	2.79	.....	8.30	*Idaho.*	
Lake	8	2.50	.....	8.06	Eagle Rock	0.30
do.	22	2.92	.....	.....	*Montana.*	
Brookhaven	8	3.00	.....	7.60	Fort Benton	0.35
Edwards	7	2.75	.....	7.41	*Nevada.*	
Fayette	.....	.....	.....	7.20	Boca	0.00
Grenada	8	2.70	.....	.....	Carlin	0.00
Jackson	8	2.50	.....	.....	Elko	0.05
Batesville	10	2.53	.....	.....	Beowawee	0.07
Meridian	22	3.20	.....	.....	Tecoma	0.15
Missouri.					Golconda	0.16
Protem	7	2.68	.....	10.56	Browns	0.20
Ironton	.....	.....	.....	9.55	Wadsworth	0.25
Springfield	.....	.....	.....	8.07	Carson City	0.29
Centreville	.....	.....	.....	8.06	Pioche	0.29
Chamois	.....	.....	.....	7.33	Fort McDermitt	0.34
Salem	.....	.....	.....	7.04	Palisade	0.35
Nebraska.					Otega	0.37
Lincoln	17	2.75	.....	11.33	Humboldt	0.40
do.	19	3.00	.....	.....	Hot Springs	0.50
do.	22	3.25	.....	.....	*New Mexico.*	
New Hampshire.					Deming	0.00
Auburn	.....	.....	.....	11.50	La Mesilla	0.10
Mt. Washington	.....	.....	.....	8.91	Fort Wingate	0.14
New Jersey.					*Oregon*	
Paterson	28	4.12	.....	13.56	Umatilla	0.26
Barnegat	12	2.55	.....	7.22	*Texas.*	
Sandy Hook	12	3.04	.....	7.21	El Paso	0.10
New York.					*Utah.*	
Troy	.....	.....	.....	9.65	Terrace	0.00
Fort Porter	.....	.....	.....	7.14	Kelton	0.00
Port Jervis	.....	.....	.....	7.00	Corinne	0.05
Ohio.					Ogden	0.20
New Athens	31	1.25	2 hrs.	10.61	Salt Lake City	0.26
Columbus	.....	.....	.....	9.59	.....	.....
Bethel	.....	.....	.....	9.00	.....	.....
College Hill	.....	.....	.....	8.50	.....	.....
Cincinnati	.....	.....	.....	8.47	.....	.....
Westerville	.....	.....	.....	8.43	.....	.....
North Lewisburg	.....	.....	.....	7.95	.....	.....

Table of Special Heavy, Largest and Smallest Monthly Rainfalls—Continued.

STATION.	SPECIAL HEAVY.			Largest Monthly.	SMALLEST MONTHLY.	
	Date.	Amt.	Duration	Amount, Incees.	STATION.	Amt.
Bellefontaine				7.87		
Sandusky				7.11		
Pennsylvania.						
Wellsboro				9.12		
Milton				8.05		
Tennessee.						
Grand Junction	9 and 10	5.43		12.18		
Milan	9 and 10	6.10		10.87		
Corinth	10	4.15		9.82		
Ashwood				9.80		
Withe	9 and 10	5.05		9.47		
Paris	9 and 10	4.02		9.41		
Memphis	9	3.22		9.14		
Austin				8.40		
Nashville				7.34		
Texas.						
New Ulm	7	2.63		12.25		
do.	27	2.63				
Austin	6 and 7	5.82		9.86		
Hempstead	27 and 28	5.00		9.06		
Paris	7	3.55		7.89		
Palestine	7	2.79		7.56		
Fort Elliott				7.48		
Brownsville	19	2.62		7.07		
Dallas	7	2.51				
Belton	6 and 7	5.33				
Sour Lake	7	3.50				
Tyler	7	2.80				
Waco	7	2.50				
Corsicana	7	3.00				
Fort McKavett	20	1.26	2 hrs.			
West Virginia.						
Wellsburgh				8.05		
Helvetia				7.15		
Wisconsin.						
Manitowoc				7.99		

The following table shows the maxima and minima of rainy and cloudy days and percentages of relative humidity as reported from the various districts:

Table of rainy and cloudy days and relative humidity for May, 1882.

Districts.	Rainy days	Cloudy days.	Relative humidity.
			Percentages.
New England	From 12 to 20	From 8 to 16	From 58.8 to 87.0.
Middle Atlantic states	" 13 " 23	" 9 " 15	" 62.9 " 81.8.
South Atlantic states	" 7 " 17	" 3 " 11	" 64.3 " 80.0.
Florida peninsula	" 10 " 13	" 3 " 6	" 67.3 " 70.5.
East Gulf states	" 8 " 12	" 5 " 8	" 64.7 " 73.0.
West Gulf states	" 4 " 19	" 3 " 14	" 56.2 " 79.7.
Rio Grande valley	" 8 " 15	" 8 " 15	" 62.5 " 83.2.
Ohio valley and Tennessee	" 16 " 20	" 6 " 14	" 66.9 " 72.4.
Lower lake region	" 14 " 20	" 7 " 16	" 64.7 " 71.7.
Upper lake region	" 8 " 19	" 6 " 13	" 58.2 " 73.3.
Extreme northwest	" 10 " 15	" 6 " 11	" 63.4 " 74.6.
Upper Mississippi valley	" 9 " 20	" 9 " 16	" 52.7 " 72.5.
Missouri valley	" 13 " 19	" 10 " 17	" 67.1 " 73.5.
Northern slope	" 10 " 19	" 4 " 16	" 55.7 " 69.7.
Middle slope	" 10 " 19	" 4 " 10	" 58.9 " 85.6.
Southern slope	" 7 " 11	" 3 " 11	" 55.3 " 68.3.
Southern plateau	" 0 " 9	" 0 " 4	" 29.5 " 36.5.
Middle plateau	" 4 " 6	" 3 " 5	" 30.0 " 37.8.
Northern plateau	" 5 " 15	" 3 " 10	" 30.0 " 65.7.
North Pacific coast region	" 13 " 14	" 12 " 14	" 61.3 " 69.3.
Middle Pacific coast region	" 3 " 4	" 1 " 4	" 41.2 " 72.2.
South Pacific coast region	" 0 " 4	" 1 " 9	" 36.4 " 71.3.

SNOW.

The dates on which snow fell in the various states and territories are as follows:

New Hampshire, at Mount Washington, from 1st to 4th, 11th to 15th, 18th to 21st, 23d to 26th; elsewhere in the state on the 2d, 11th, 12th, 15th, 18th.

Vermont, 2d, 11th.

Massachusetts, 2d, 11th, 12th, 13th, 17th, 18th.

Pennsylvania, at Williamsport on the 6th.

Michigan, 1st, 2d, 23d.

Illinois, 6th, 22d, 23d.

Minnesota, 20th, 21st, 22d.

Dakota, 20th, 21st, 22d.

Montana, 8th, 16th, 18th, 19th, 20th, 22d.

Wyoming, 7th, 8th, 19th, 21st, 22d.

Colorado, on summit of Pike's Peak, 1st, 2d, 5th to 11th, 17th, 21st, 24th to 31st; elsewhere in state from 8th to 11th.

New Mexico, 6th, 7th, 8th, 20th, 21st, 26th.

Idaho, Mission, 19th.

Washington territory, 1st, 5th, 11th, 12th.

Nevada, at Winnemucca on the 4th and Pioche on the 7th.

In connection with the remarkable and very unusual snow-storms of this month, the following interesting items are given:

Pennsylvania: Pottsville, 6th, heavy snow-storm prevailed; at Trackville, three inches of snow fell.

Iowa: Marshalltown, 23d, about 1 a. m., heavy snow. Washington, 12th, from four to six inches of snow fell in the early part of the morning.

Clinton, 23d, snow fell to a depth of one inch.

Davenport, 23d, from 2 a m., until 5.40 a. m., heavy snow-storm; fully three inches of snow fell; at daylight, one inch remained on the ground. No such storm is remembered as ever having occurred here at this season. Reports from Mehaska, Wapello, and Van Buren counties state that from one-half to two inches of snow fell during the storm. Muscatine, 23d. About two inches snow fell.

Illinois: Riley, 23d, 4.30 to 6 p. m., snow-storm prevailed, being the latest date on which snow has fallen during a record of twenty-nine years.

Maine: Eastport, 15th, snow fell to a depth of three inches, and at Dexter, on the same day, three inches of snow fell.

Massachusetts: 19th, in the southern and eastern parts of Berkshire county, snow fell to a depth of one inch.

New Jersey: 11th, in Warren county, several heavy falls of snow have occurred. South Orange, 6th, a few flakes of snow fell.

North Carolina: Reports from Highlands, 14th, state that the Balsom mountains, seventy miles northwest of that place are covered with snow.

Vermont: Burlington, 1st, heavy snow-storm during the day.

DEPTH OF SNOW ON GROUND AT END OF MONTH.

Mount Washington, New Hampshire: Three inches.

Santa Fé: Six inches of snow remain on the mountains north of station.

HAIL.

Mount Ida, Arkansas, 10th, at 6 p. m.: A violent hail storm visited this place. Trees were prostrated and tender vegetation was torn to shreds. The hail-stones were unusually large.

Logansport, Indiana, 4th: Severest hail storm that has visited this place for many years, accompanied by high winds, thunder and lightning. The hail-stones measured from three-quarters to more than an inch in length. Considerable damage was done to crops and a large amount of window-glass was broken. Several buildings were blown down and many others unroofed. The storm began at 6.30 p. m., and lasted thirty minutes.

Emmittsburg, Maryland, 28th: Hail-stones sufficiently large to break window-glass.

Troy, New York, 28th: Hail storm, doing great damage to crops.

New Athens, Ohio, 27th: Hail storm at 2.30 p. m., covering the ground with hail-stones, some of which were as large as hulled walnuts.

Shreveport, Louisiana, 10th: A terrific thunder-storm began at four p. m. From 6.10 to 6.15 p. m. hail-stones as large as hen's eggs fell. At Baskom station, twenty miles west of this place, the storm was more severe. The cotton crop was slightly injured. The principal damage done at this place was the breaking of glass in all windows of northwestern exposure.

Logansport, Indiana, 4th: During a severe storm hail-stones of immense size fell, destroying all glass exposed. The cost of glass used to replace that broken during the storm is estimated at $2,000.

Chattanooga, Tennessee, 10th: From 12.17 to 12.30 p. m. hail-stones three-eighths of an inch in diameter fell, doing slight injury to small fruits; 15th: from 12.57 to 1.03 p. m.

hail storm from southwest to northeast. Hail-stones measuring half an inch in diameter fell, doing considerable injury to fruit and vegetables.

Brackettville, Texas, 6th: A terrific hail storm struck this station at eight p. m., and was accompanied by high winds and vivid lightning.

St. Louis, Missouri, 5th: One of the severest hail-storms that has visited this city for many years, occurred between 4.37 and 4.58 p. m. The storm was preceded during the morning and early afternoon by a low barometer; the temperature rose rapidly and the atmosphere was sultry and oppressive. At about four p. m., dense masses of cumulo-stratus clouds appeared in the southwest and rapidly covered the sky. As their eastern edge neared the zenith, large round drops of rain began to fall, and vivid flashes of lightning were observed in the southwestern sky. A few minutes later, rain descended in sheets accompanied by loud peals of thunder. Rain continued to fall in torrents until hail began at 4.37 p. m., when it somewhat subsided. At the beginning, the hail-stones were about the size of peas, but they soon increased in size until they assumed the proportions of walnuts. From 4.37 to 4.50 p. m., hail-stones varying from the size of hazelnuts to walnuts showered down with terrific and destructive violence. From 4.30 to 4.45 p. m., the wind blew from the west at the rate of forty-two miles per hour, having suddenly increased to that velocity from twelve miles. From 4.51 to 4.58 p. m., the hail-stones were very large, but fell with less force than those that fell previous to that time. During the passage of the storm the barometer suddenly rose 0.10 inch, after which it fell to its former reading. Hail-stones as large as hen's eggs fell in various parts of the city; and in some instances were reported to have been as large as a "base-ball." The largest found on the roof of the building in which the office is located, weighed three-fourths of an ounce and measured five inches in circum ference. The largest stones were quite soft and contained but little ice, while those of smaller size were very hard and contained but a small quantity of snow. After the passage of the storm the wind shifted to northwest, the temperature fell decidedly with a corresponding increase of pressure. The damage done by this storm has not been accurately determined, but is very great. During the storm many accidents occurred by the running away of teams, which were tortured by the falling hail-stones.

Hickman, Kentucky, 12th: At 2 p. m., a furious hail-storm set in, lasting about five minutes.

Shelbyville, Illinois, 5th: The severest hail storm that has occurred for many years visited this place between four and five p. m. The hail-stones were as large as walnuts, breaking many windows and doing great damage to gardens and farms.

Litchfield, Illinois, 5th: One of the heaviest rain and hail storms ever experienced in this vicinity occurred during the afternoon. The hail-stones were as large as hickory-nuts. The occurrence of hailstorms of less violence have been reported as follows: Newport, Rhode Island, 20th; Portland, Maine, 2d; Albany, New York, 12th; Lynchburg, Virginia, 6th; Fort Macon, North Carolina, 11th; Denison, Texas, 9th; Shreveport, Louisiana, 10th; Little Rock, Arkansas, 8th, 9th; San Antonio, Texas, 5th, 7th; Laredo, Texas, 6th; Rio Grande City, Texas, 15th; Knoxville, Tennessee, 12th, 15th, 16th; Logansport, Indiana, 4th; Sandusky, 27th; Toledo, Ohio, 6th; Marquette, Michigan, 24th; Duluth, Minnesota, 10th, 25th; Keokuk, Iowa, 5th; Des Moines, Iowa, 3d; Saint Paul, Minnesota, 8th; Springffeld, Illinois, 27th; Huron, Dakota, 20th; Cheyenne, Wyoming, 15th; Rapid City, Dakota, 30th; Fort Keogh, Montana, 15th; Fort Custer, Montana, 19th; Fort Washakie, Wyoming, 25th; Fort Shaw, Montana, 4th, 18th; Fort Ellis, Montana, 15th, 18th; Helena, Montana, 16th, 27th, 29th; West Las Animas, Colorado, 5th, 26th; Grierson Springs, Texas, 17th; Stockton, Texas, 30th; Fort Elliott, Texas, 24th; Tucson, San Carlos, and Fort Grant, Arizona, 8th; Winnemucca, Nevada, 24th; Pioche, Nevada, 25th; Eagle Rock, Idaho, 28th; Umatilla, Oregon, 18th; Spokane Falls, Washington territory, 18th; Portland, Oregon, 14th, 18th; Fort Bidwell, California, 2d; Fort Lyon, Colorado, 30th; Fort Garland, Colorado, 7th, 10th, 30th, 31st; Fort Randall, Dakota, 3d; Fort Sisseton, Dakota, 19th; Fort Snelling, Minnesota, 9th; Fort Union, New Mexico, 6th, 17th 31st; Camp near Presidio, Texas, 2d; Fort Monroe, Virginia, 10th; Green Springs, Alabama, 11th, 18th; Anna, Illinois, 8th, 12th, 27th; Elmira, Illinois, 5th; Laconia, Indiana, 4th, 27th; Logansport, Saint Meinrad and Wabash, Indiana, 4th; Vevay, Indiana, 4th, 5th; Cresco and Nora Springs, Iowa, 4th; Muscatine, Iowa, 5th; Holton, Kansas, 25th; Clay Centre, Kansas, 26th; Wellington, Kansas, 27th; Cornish, Maine, 2d; Somerset, Massachusetts, 11th, 18th; Westborough, Massachusetts, 18th; Minneapolis, Minnesota, 8th; Protern, Missouri, 5th, 8th; De Soto, Nebraska, 26th; Genoa, Nebraska, 4th; New Market, New Hampshire, 2d, 18th; Freehold and South Orange, New Jersey, 6th; Flushing and Troy, New York, 28th; Murphy, North Carolina, 6th, 10th; Weldon, North Carolina, 10th; New Athens, Ohio, 27th; Albany, Oregon, 12th; Dybery, Pennsylvania, 18th; Meadville, Pennsylvania, 1st; Clarksville, Texas, 26th; Wytheville, Virginia, 5th; Manitowoc, Wisconsin, 8th; Mission, Idaho, 12th.

SLEET.

Sleet was reported as follows: Boston, 8th; Fort Yates, Dakota, 20th; Dubuque, Iowa, 5th; Burlington, Iowa, 23rd; Cheyenne, Wyoming, 21st; North Platte, Nebraska, 22d; Fort Washakie, Wyoming, 9th; Pike's Peak, Colorado, 1st, 2nd, 5th, 6th, 25th; Santa Fé, New Mexico, 9th; Fort Garland, Colorado, 9th; Anna, Illinois, 12th; Huron, Dakota, 20th.

COTTON REGION REPORTS.

The following table gives the average rainfall, mean of the maximum and mean of the minimum temperatures, in each of cotton districts; as shown on the chart issued with the April REVIEW.

Meteorological Record for the Cotton Districts for the month of May, 1882.

DISTRICTS.	Average rainfall in inches.	Mean of the maximum.	Mean of the minimum.
New Orleans	5.57	84.4	61.1
Savannah	2.59	84.8	60.7
Charleston	2.53	81.9	58.1
Atlanta	2.39	78.9	56.2
Wilmington	2.52	79.0	54.6
Memphis	7.58	77.7	56.3
Galveston	5.25	83.9	59.9
Vicksburgh	7.03	81.9	60.8
Montgomery	3.02	81.9	58.2
Augusta	2.11	82.2	57.8
Little Rock	11.04	78.7	53.6
Mobile	4.69	83.4	58.3

WINDS.

The prevailing direction of the winds during the month of May at Signal Service stations are shown on chart ii, by arrows flying with the wind. On the New England coast they were mostly from the south and southwest; in the middle Atlantic states from the northeast, south and southwest; in the south Atlantic states, from the south and southwest; in Florida, from the east; in the Gulf states, Rio Grande valley and southern slope, from the south and southeast; in Tennessee and the Ohio valley, mostly from the south; in the lower lake region, from the northeast and east, except at Oswego and Rochester, where they were westerly; in the upper lake region, mostly from the north; in southern California they were westerly; in the north and middle Pacific coast regions from the north and northwest; elsewhere they were variable.

TOTAL MOVEMENTS OF THE AIR.

The following are the largest total movements at Signal Service stations: Mount Washington, 27,241 miles; Pike's Peak, Colorado, 14,716; Delaware Breakwater, Delaware, 12,967; New Shoreham, Rhode Island, 12,382; Portsmouth, North Carolina, 12,313; Hatteras, North Carolina, 11,972; Indianola, Texas, 11,495; Kitty Hawk, North Carolina, 11,354; Dodge City, Kansas, 11,276; Thatcher's Island, Massachusetts, 10,870; Sandusky, 10,631; Cape Henry, Virginia,

10,298; Galveston, 10,216; Sandy Hook, New Jersey, 10,214; Milwaukee, 10,211; West Las Animas, Colorado, 9,983; Barnegat, New Jersey, 9,878; Macon, North Carolina, 9,783; Cape May, New Jersey, 9,771; Champaign, Illinois, 9,610; Fort Elliott, Texas, 9,411; North Platte, Nebraska, 9,393; Concho, Texas, 9.364: Atlantic City, New Jersey, 9,303; Fort Keogh, Montana, 9,211; Moorhead, Minnesota, 9,182; Stockton, Texas, 9,125; Huron, Dakota, 8,966; Boston, 8,955; Port Eads, Louisiana, 8.739; Bismark, Dakota, 8,707; Omaha, 8.495; Grand Haven, Michigan, 8,478; Cheyenne, Wyoming, 8.457; Madison, Wisconsin, 8,346; San Francisco, 8,300; Yankton, Dakota, 8,294; Coleman City, Texas, 8,230; Saint Paul, 8,221; Fort Bennett, Dakota, 8,194; Eagle Rock, Idaho, 8,088; Rochester, 8,043. The *smallest* are: La Mesilla, New Mexico, 2,502; Roseburg, Or., 2.540; Lynchburg, Virginia, 2,695; Silver City, New Mexico, 2,847; Visalia, California, 2,946; Missoula, Montana, 3,101; Vicksburg, 3,132; Tucson, Arizona, 3,133; Nashville, 3,362; Williamsport, Pennsylvania, 3,489.

HIGH WINDS.

The highest velocity reported during the month, (100 miles, nw.) occurred on the summit of Mount Washington, on the third. At that station velocities of fifty miles and over occurred each day during the month, except on the following dates: 3d, 4th, 16th, 19th and 22d.

Velocities exceeding seventy-five miles occurred as follows: 76, n w., 1st; 82, nw., 2d; 94, nw., 4th; 92, nw., 5th; 76, n., 9th; 84, nw., 21st; 76, w., 28th; 85, nw., 30th.

Other stations reporting velocities of fifty miles per hour or over, are as follows: Delaware Breakwater, Delaware, 58, e., 11th, and 54, ne., 12th; Fort Benton, Montana, 60, ne., 12th; Pike's Peak, Colorado, 55, sw., 19th; Dodge City, Kansas, 62, nw., 19th; West Las Animas, Colorado, 54, ne., 22d; Palestine, Texas, 60, s.w., 5th; Indianola, Texas, 52, n., 31st; Galveston, 60, nw., 31st; Toledo, 52, e., 6th.

LOCAL STORMS.

Mount Ida, Arkansas, 8th: About 7.45 p. m. a violent tornado passed in a northeasterly course about two miles south of this place, destroying everything in its path. More than one hundred buildings were demolished; two persons were killed, and several injured; many horses, mules, cattle, and poultry were killed. The storm was accompanied by hail and rain.

Fort Wayne, Indiana, 27th: At 2 p. m. a tornado of tremendous force struck this county at the intersection of Madison, Monroe, Jackson and Jefferson townships, destroying several dwellings; barns and smaller buildings were also blown down and their timbers strewn for miles along the course of the storm. The width of the storm-track was not more than five rods, within which the destruction was very great.

Emmittsburg, Maryland, 28th: Severe storm, uprooting trees.

Clarksville, Texas, 30th: Severe storm occurred during the night, beating down fields of corn, wheat, and oats, and breaking large limbs from trees. The storm lasted thirty minutes.

Delaware Breakwater, 11th, 10.30 p. m.: The severest storm ever experienced at this season began and continued during the night. The signal office was filled with water from the sea washing over the breakwater. The American barkentine "John Boizly" dragged anchor and went ashore near Green Hill light, four miles west-southwest of station, and was strained badly.

New York: The storm of the eleventh and twelfth is considered to have been the most severe that has been experienced on this coast during the past twenty-nine years. The track of the New Jersey Southern railroad was washed away near Sandy Hook. The s. s. "Pliny," bound from Rio de Janeiro to New York, stranded near Long Branch, New Jersey, at three p. m. of the thirteenth.

Starkville, Mississippi, 10th: Storm during night; wind reaching a velocity of thirty-six miles. One building in course of construction was blown down.

Palestine, Texas, 5th: Severe storm, during which a wind velocity of sixty miles per hour was recorded. No serious damage was done at this place.

Logansport, Indiana, 4th: During a violent storm, several buildings at this place suffered injury. The post-office building had its plate-glass window blown out.

Cairo, Illinois, 8th: Heavy storm began at 8.05 and continued until 8.30 p. m. Four cars, occupied by fourteen section hands, on the track of the narrow-gauge railroad in the northern part of the city, were overturned and blown down an embankment. For five minutes the wind blew at the rate of forty-eight miles per hour.

Shreveport, 12th: Houses, forests, and plantations were wrecked in this region this morning by a tornado. One man and two children were killed, and many others dangerously wounded. Near Acadia many houses were destroyed and a large number of cattle killed. A new building was blown down upon a number of workmen, none of whom were killed.

Atchison, Kansas, 12th: A tornado at Cherokee City, a small watering place south of Marysville, killed two persons and wounded thirteen. Forty houses were demolished.

Petersburg, Virginia, 11th: A tornado visited the southeastern part of this state, blowing down several residences and barns and did considerable damage to crops.

Edwards, Mississippi, 12th: Severe storm visited this place last night; a number of residences were blown down or otherwise injured.

Louisville, 6th: During the storm last evening a steamer was blown from her moorings, a distance of about forty yards up the river when she swung around and struck a loaded coal-flat, which had to be unloaded to prevent it from sinking.

Keokuk, 6th: Reports from various points throughout the Des Moines valley and the vicinity of this city show that the storm of last night was unusually severe. Telegraph wires were prostrated and railroad travel delayed. The Chicago, Rock Island and Pacific railroad is under water three miles above Daniels. Several bridges were washed out on the Burlington and Southwestern and other railroad lines.

Hot Springs, Arkansas, 13th: Reports from Silver City, Arkansas, show that a violent tornado visited that place on the evening of the eighth. Stock, timber, fences and orchards were destroyed or injured. At Cado' Cave, a residence was blown down and three occupants were thrown into a well. At Williams' Creek, buildings were wrecked and several persons injured. At McKinney's plantation about fifty buildings were destroyed. The damage done at this place will amount to $30,000. At South Fork the postoffice was lifted and carried away and its contents destroyed. Hundreds of sheep, hogs, horses, and cattle were lost or killed, and $5,000 in silver and currency were scattered to the winds and lost. One hundred families are rendered homeless and without shelter. The total damage incurred will not fall short of $150,000. The storm appeared suddenly and was of short duration and moved in a southeasterly direction. At McAllister, a mining settlement in the Indian territory, on the night of the eigth, a most violent tornado occurred, almost destroying the entire place. Fifty-nine houses were totally demolished and twenty-seven damaged to a more or less extent. Twenty-one persons were killed and forty-two wounded. Settlements numbers five and seven of the Osage Mining Company were the ones visited, the latter receiving only the partial force of the storm. The fall of rain was very great and was accompanied by a large quantity of hail-stones, which fell as far north as Fort Gibson. A washout occurred on the Missouri, Kansas, and Texas railroad near Armstrong, causing suspension of travel. At Paris, Texas, the storm was also severe, and great damage was done to property.

Vandalia, Illinois, 5th: A heavy rain-storm accompanied by strong wind swept over this region at six p. m., causing considerable damage in this city and in the vicinity of the town of Crouch.

Warrenton, Missouri 9th: A tornodo struck the Central Wes-

leyan College building about 12:15 a. m., completely wrecking it. There were seven persons sleeping in the building at the time who escaped unhurt. Parts of the roof were carried for a distance of a half a mile, and some of the timbers were driven into the ground to a depth of from two to three feet. The damage is estimated from ten to fifteen thousand dollars. At Mound City, Atchison county, the damage done was very great. Large trees were twisted off and others uprooted.

Jerseyville, Illinois 9th: Severe storm passed over this county, striking this city about one a. m. The heavy walls of a business house were blown down, together with a brick smoke-stack and numerous chimneys. Several out-buildings in vicinity were blown down. Near Newburn, forty miles of fence was destroyed, and in that section the storm was accompanied by hail, which did much damage to wheat.

Bunker Hill, Illinois, 9th: The storm of wind and rain of last night was most severe. Large numbers of shade and forest trees were uprooted.

Minneapolis, Minnesota, 9th: It is reported that a school-house five miles southwest of Lakefield was struck by a tornado yesterday. The building was lifted and scattered over the prairie. It was occupied by a teacher and eleven pupils, all of whom are more or less injured. The storm appeared in the form of a funnel-shaped cloud, which bounded along the prairie and passed into Herron lake, sucking up water to a height of one hundred feet.

Memphis, 10th: The severe storm, which swept over this section yesterday afternoon, did considerable damage. To the south and in the vicinity of Moor's Landing, trees and fences were blown down.

Fort Benton, Montana, 12th: Severe storm during night; wind attaining a velocity, for a few minutes, of seventy miles per hour. No serious damage resulted.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for May, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 89.5 per cent. The percentages for the four elements are: Weather, 92.9; Direction of the Wind, 88.8; Temperature, 88.2; Barometer, 87.9 per cent. By geographical districts they are: For New England, 84.8; middle Atlantic states, 87.8; south Atlantic states, 91.2; east Gulf states, 90.1; west Gulf states, 91.3; lower lake region, 90.6; upper lake region, 88.3; Tennessee and the Ohio valley, 90.7; upper Mississippi valley, 90.4; lower Missouri valley, 89.8; northern Pacific coast region, 77.1; middle Pacific coast region, 96.9; southern Pacific coast region, 87.5

There were sixty-nine omissions to predict (twenty-one being due to the absence of reports from the Pacific coast) out of 3,813, or 1.8 per cent. Of the 3,744 predictions that have been made, 53, or 1.42 per cent., are considered to have entirely failed; 85, or 2.27 per cent., were one-fourth verified; 292, or 7.80 per cent., were one-half verified; 521, or 13.92 per cent., were three-fourths verified; 2,793, or 74.59 per cent., were fully verified, so far as can be ascertained from the tri-daily reports.

CAUTIONARY SIGNALS.

Ninety-one cautionary signals were displayed during the month of May, of which seventy three or 80.2 per cent were justified by winds of twenty-five miles per hour, at or within one hundred miles of the station. Thirteen "off-shore" signals were displayed, of which six, or 46.2 per cent., were fully justified; ten, or 76.9 per cent., were justified as to direction; and six, or 46.2 per cent., were justified as to velocity One hundred and four signals of all kinds were displayed, of which seventy-nine, or 76 per cent., were justified. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only.

Seventeen signals were reported late.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right hand of chart iii., are given the highest and lowest stages of water observed at Signal Service stations during the month of May, 1882. The Mississippi at Vicksburgh continued to fall, but remained above the danger line throughout the month. At New Orleans, the lowest point, [two inches below the danger-line] was reached on the twenty-ninth. At Memphis on the twenty-second, the water rose to within nine inches of the danger line; at Cairo on the twenty-second to thirty inches, and at Keokuk on the sixth, to twenty-two inches above the danger line. The highest water in the Ohio occurred from the thirteenth to the eighteenth. The Missouri was highest at Leavenworth on the twenty-second and thirty-first, and at Omaha on the twentieth.

FLOODS.

The excessive rainfall in the western Gulf states during the month has caused disastrous floods, entailing loss of life and much damage to property, especially in the state of Arkansas.

At Jacksonport, Arkansas, the overflow was the most destructive that has been visited that section for years. The town was completely submerged, and many persons were obliged to take refuge in the upper stories of storehouses.

The flood is said to have been the highest since 1876, the whole country for miles around being a sea of water. The damage to the wheat crop is very great.

At Batesville, Arkansas, May 12th, during a heavy rain-storm, which continued in torrents for twenty-four hours, the rivers and creeks rose to an unusual height. Mills, houses, bridges, and fences were washed away, and not only the crops, but in many cases, the soil is gone, leaving only a bare clay surface. The damage to property in the valley of the White river is generally estimated at more than $500,000.

At Hot Springs, the damage to property amounted to $30,000; all the bridges and foot-paths were destroyed, several buildings were washed to pieces, and the foundations of others were weakened. Stables, small outhouses, sheds, &c., were totally carried away. Railroad communication was entirely suspended owing to the damage sustained by the tracks and the destruction of bridges.

In Conway county, the destruction was very great, many acres of land being submerged and the crops destroyed; the total loss in this county is estimated at $100,000.

At Little Rock, on the ninth, the streets were flooded, those leading in the direction of the river having the plank sidewalks washed away. The railroad tracks suffered injury and trains were delayed.

Reports from southern Illinois, dated May 5th, state that heavy and unprecedented rains have swollen all rivers and creeks, and caused considerable damage to movable property and growing crops in the bottom lands. The Saint Louis and Keokuk railroad is under water and railroad traffic is suspended. Serious washouts also occurred on the Chicago, Burlington and Quincy railroad, obstructing travel.

The observer at Cairo, reports that much damage has been done to the crops in that locality by the heavy rains and floods.

In southern Indiana, the counties of Jackson, Lawrence, and Martin were inundated and entire crops destroyed. Fifteen miles of track on the Bedford narrow-gauge railroad were washed away.

At Owingsville, Kentucky, May 12th, the heavy rains caused an overflow in Prickley-Ash creek, sweeping everything before it. All the fencing along the creek was swept away, and much stock was lost; wheat and corn planted in the bottoms suffered considerable damage.

Reports from Memphis, Tennessee, May 10th, stated that fears are entertained that another overflow may occur

The Wolf river, to the east of Memphis, has overflowed and washed away several hundred yards of the levee at Raleigh,

and 600,000 to 1,000,000 feet of logs were carried out of the river.

Numerous plantations are already saturated with water from the threatening river.

At Shreveport, Louisiana, 17th, the Red river rose rapidly, caused by the swollen condition of its tributaries. Much damage was done to the cotton crop, and many farmers along the river have plowed up the cotton and are planting corn and millet.

Reports from Bolivar county, Mississippi, dated May 22d, state that 7,000 acres of land are under water in that county.

At Palestine, Texas, on the seventh, heavy rains caused washouts on the railroad; two bridges and trestle-work near Buffalo creek were destroyed.

At Saint Vincent, Minnesota, 4th, the lower part of the town was about twenty inches under water. On the eleventh the water receded but on the fifteenth again rose, and reached the habitations, causing several families to vacate their dwellings. The average depth of water throughout the town was from three to four feet, except in the extreme northern part, which was not overflowed. The rise being gradual, the people were enabled to secure their property and the damage was consequently slight. The overflowed region extended from Breckenridge, Minnesota, to Morris, Manitoba, about twenty-five miles north. No damage occurred to crops in the vicinity of Saint Vincent, as the average width of the flood on either side of the river, contiguous to the town, did not exceed one mile.

Keokuk, Iowa, during the sixth and seventh, the Skunk and Des Moines rivers rose rapidly, washing out railroad tracks and causing considerable damage.

HIGH TIDES.

New London, Connecticut, 12th, 26th.

Little Egg Harbor, New Jersey, 11th, 12th.

Fort Macon, North Carolina, 15th.

Hatteras, North Carolina, 14th, very high tide; overflowing the greater portion of the island.

Portsmouth, North Carolina, 14th.

Cape Lookout, North Carolina, 13th, cape nearly covered.

New River, North Carolina, 13th, highest tide since 1876.

Indianola, Texas, 9th.

Flushing, New York, very high tides on 10th, 11th, 12th.

Delaware Breakwater, 13th.

New York, 11th, 12th, highest tides ever known, causing great damage at various watering places along the coasts of Long Island and New Jersey.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service Stations, with the average depth at which observations were taken, is given in the table on the right-hand of chart ii. In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the same period.

The following table gives the highest and lowest temperature of water at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken. It will be seen that the greatest ranges of water temperature occurred at the following stations: Chincoteague, 21°; Galveston, 19°; New Haven, 16°; Alpena and Toledo, 15°.

Temperature of Water for May, 1882.

STATION.	Temperature at bottom.		Range.	Average depth in feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°	ft. in.	°
Atlantic City	59.3	51.2	8.1	5 7	73.2
Alpena	55.	40.	15.0	12 0	44.4
Augusta	79.9	68.	11.3	6 10	69.7
Baltimore	67.	55.	12.0	9 11	70.4

Temperature of Water for May, 1882—Continued.

STATION.	Temperature at bottom.		Range.	Average depth in feet and inches.	Mean temperature of the air at station.
	Max.	Min.			
	°	°	°	ft. in.	°
Boston	54.5	45.2	9.3	25 0	49.8
Buffalo	57.	46.	11.0	9 11	49.3
Burlington					
Cedar Keys	84.	70.	14.0	9 2	75.2
Charleston	77.4	67.4	10.0	41 9	71.7
Chincoteague	70.	49.	21.0	6 0	56.2
Cleveland	59.1	48.6	10.5	14 0	51.9
Detroit	57.	45.	12.0	24 3	53.2
Duluth	45.	36.	9.0	14 11	46.1
Delaware Breakwater	63.5	51.	12.5	8 7	55.0
Eastport	39.7	35.8	3.9	15 8	43.5
Escanaba	52.	40.	12.0	15 0	46.6
Galveston	83.	64.	19.0	14 8	75.2
Grand Haven	58.5	46.5	12.0	19 0	51.9
Indianola	82.4	71.7	10.7	9 8	75.8
Jacksonville	81.	73.	8.0	18 0	74.6
Key West	87.2	77.8	9.4	17 1	80.0
Marquette	46.9	38.0	8.0	10 8	46.0
Milwaukee	51.5	42.6	8.9	8 0	48.7
Mobile	75.5	69.0	6.5	16 0	72.6
New Haven	63.2	47.2	16.0	14 9	51.3
New London	54.	46.	8.0	13 2	51.5
Newport	55.1	43.9	11.2	10 9	49.8
New York	59.	48.5	10.5	22 7	53.5
New Shoreham	53.8	44.8	9.0	9 4	48.9
Norfolk	70.	60.	10.0	16 11	63.0
Pensacola	77.7	72.	5.7	17 9	72.8
Portland, Me	48.5	40.5	8.0	19 1	51.5
Portland, Oreg	58.8	50.	8.8	76 4	56.3
Port Eads	70.5	67.	3.5	9 9	74.1
Provincetown	53.5	44.	9.5	14 0	48.0
Punta Rassa	87.	76.6	10.4	11 8	76.7
Sandusky	59.7	48.5	11.2	10 0	52.8
Sandy Hook	56.6	47.9	8.7	2 3	54.3
San Francisco	58.6	53.6	5.0	29 4	56.2
Savannah	78.8	69.9	8.9	13 3	72.8
Smithville	75.	67.	8.0	10 0	68.0
Thatcher's Island	50.6	40.5	10.1	7 0	47.8
Toledo	65.	50.	15.0	12 1	53.4
Wilmington	74.5	68.	6.5	18 0	68.5

ATMOSPHERIC ELECTRICITY.

AURORAS.

No remarkable auroral displays were observed during the month. The most important display occurred on the seventeenth, and was reported by stations in New England, Alpena, Michigan, and Bismarck, Dakota, as follows: Portland, Maine: A faint auroral light visible from 9 to 11 p. m. Gardiner, Maine: Faint aurora visible from 10 p. m. to 12.30 a. m. of the eighteenth; Mount Washington: Faint aurora visible from 10.15 p. m. until 12.20 a. m. of the eighteenth, extending from northwest to northeast, and to an altitude of 15°; Burlington, Vermont: From 11 to 11.40 p. m., aurora consisting of a dark segment with a few well-defined streamers; Alpena, Michigan: From 8.40 to 11.40 p. m., aurora consisting of a diffuse light in the northern sky, with a few faint streamers shooting towards the zenith; Bismarck, Dakota: Auroral light visible from 9 to 11 p. m.; beams reaching altitude of 15° were observed from 9.30 to 10 p. m. Other displays have been reported as follows:

Antrim, New Hampshire, 5th,: Aurora observed during the evening.

New Corydon, Indiana, 9th,: Faint aurora observed from ten p. m. until midnight.

Pensacola, Florida, 9th, from 8 to 9.15 p. m.: An aurora of whitish color, sufficiently bright to attract the attention of all persons on the streets, was observed between the north and northwest. The presence of clouds prevented its extent from being more fully determined.

Bangor, Maine, 10th,: Aurora with streamers at 9 p. m.; was more brilliant at 11 p. m.

Newport, Vermont, 10th,: Aurora during the evening.

Vevay, Indiana, 10th · Faint aurora, visible from 10 to 11.30 p. m.

Eastport, Maine, 11th, from 11 to 11.40 p. m.: Aurora of bright straw color, appearing in bright flashes and fading away at intervals. In the northwest, streaks of a deep crimson color were observed.

Gardiner, Maine, 11th, 8 p. m.: Bright aurora; obscured by clouds at 10.30 p. m.

Burlington, Vermont, 11th,: Aurora seen through the openings in the clouds from 9 to 11.40 p. m. Streamers were observed in the northwestern sky at 11.15 p. m.

Mobile, Alabama, 11th: Faint aurora visible from 8 to 9 p. m. No waves or streamers were observed. It rose to an altitude of about 20° and converged toward the zenith. A short while before 9 p. m. it began to recede and soon disappeared.

Alpena, Michigan, 13th, from 9 p. m. to 2 a. m. of 14th,: Aurora consisting of a diffuse light.

Manitowoc, Wisconsin, 13th: Aurora visible during the evening.

Alpena, Michigan, 14th, 9.30 p. m.: Aurora consisting of a diffuse light with a few streamers.

Manitowoc, Wisconsin, 14th: Aurora observed during the evening.

Marquette, Michigan, 14th, from 10.35 to 11.30 p. m.: Aurora, with beams reaching an altitude of 45°, illuminating the whole northern sky.

Burlington, Vermont, 19th, from 10 to 11.45 p. m.: Aurora consisting of a dark olive-green light; no prominent features.

Bismark, Dakota, 19th, from 8 to 11 p. m.: Faint auroral light.

Lansing, Michigan, 20th,: Aurora during evening.

Hastings, Michigan, 21st,: Aurora during evening.

Marquette, Michigan, 21st, 9.45 to 11.10 p. m.: Auroral light extending across the northern heavens.

Escanaba, Michigan, 21st, from 8 to 10.15 p. m.: Diffuse auroral light with a few streamers pointing toward the zenith.

New Corydon, Indiana, 23d, 2 a. m.: Aurora with white segment; altitude 10°, azimuth 65°.

Gardiner, Maine, 25th, at midnight: A flattened auroral arch with dark cloud beneath appeared; at 3.20 a. m., the arch was brighter and extended farther eastward.

New Haven Connecticut, 26th: Dim auroral light discernible in the northern sky at 1 a. m.

Cambridge, Massachusetts, 26th: Auroral light observed at 10:15 p. m.

Gardiner, Maine, 26th: Faint auroral light from 11 p. m. to 12.30 a. m. of the 27th.

THUNDER-STORMS.

Thunder-storms were reported in the various districts on the following dates:

New England, 7th, 14th, 16th, 24th, 28th, 29th, 30th.

Middle Atlantic states, 1st, 5th, 6th, 9th, 10th, 11th, 13th, 14th, 17th, 20th, 21st, 22d, 23d, 24th, 26th, 27th, 28th, 29th, 31st.

South Atlantic states, 4th to 7th, 9th to 12th, 14th to 17th, 25th, 26th, 28th, 29th, 31st.

Florida peninsular, 1st, 2d, 6th, 7th, 8th, 10th, 11th, 15th, 24th, 26th, 27th, 29th.

East Gulf states, 6th to 11th, 13th, 20th, 21st, 27th, 28th, 29th, 31st.

West Gulf states, 2d to 10th, 13th, 20th, 25th, 26th, 27th, 30th, 31st.

Ohio valley and Tennessee, 4th, 13th, 15th, 16th, 25th to 28th, 31st.

Lower lake region, 1st, 4th, 8th, 9th, 10th, 24th, 27th, 28th, 31st.

Upper lake region, 3d, 4th, 6th to 10th, 13th, 18th, 24th, 25th, 27th, 30th.

Upper Mississippi valley, 3d, 4th, 5th, 7th, 8th, 9th, 10th, 19th, 20th, 24th to 28th, 30th, 31st.

Missouri valley, 3d, 4th, 5th, 8th, 16th, 18th, 19th, 23d, 24th, 26th, 29th, 30th, 31st.

Extreme northwest, 4th, 16th, 18th, 31st.

Northern slope, 2d, 3d, 5th, 7th, 15th, 16th, 19th, 26th to 30th.

Middle slope, 1st, 2d, 5th, 6th, 15th to 19th, 24th, 25th, 26th, 29th.

Southern slope, 1st to 6th, 8th, 9th, 16th, 17th, 18th, 21st, 23d to 26th, 28th, 29th, 30th.

Rio Grande valley, 3d, 5th, 6th, 12th, 16th, 17th, 18th, 20th, 24th, 28th, 31st.

Northern plateau, 1st, 2d, 3d, 6th, 10th, 11th, 12th, 16th, 18th, 27th.

Middle plateau, 23d, 24th, 25th, 28th.

Southern plateau, 6th, 7th, 8th, 13th, 17th, 22d, 29th, 30th.

Thunder-storms were also reported from the following stations not included in the districts named above: Portland, Oregon, 2d; Red Bluff, California, 2d; Visalia, California, 2d.

During thunder-storms the following instances of damage by lightning have occurred:

Clay Centre, Kansas, 26th: At Wakefield, sixteen miles southeast of this place, a store was struck, cutting the chimney in halves and melting a number of cans containing fruit.

Little Rock, Arkansas, 4th: A house at this place was struck; the lightning knocked down the chimney and tore off a part of the roof about ten feet square. It passed down a metallic spout and through a barrel full of water, knocked out the bottom of the barrel and entered the ground, making a hole about two feet in diameter and two feet deep. On the ninth, a tree in the state house yard was struck; at the same time a man was made insensible on the street about two hundred yards distant.

Bismarck, Dakota, 31st: Lightning struck and tore out the end of a dwelling. A man, the only occupant of the house, was thrown violently down. Silverware in the house was melted.

Huron, Dakota, 4th: Lightning struck a wind vane, passing from it to the anemometer, and from thence along the wires to the self-register, burning that instrument together with telegraph instruments, switch, and ignited the window curtain. Four distinct explosions occurred within the office, and were heard nearly a square distant. The observer felt a severe shock, which rendered him insensible for several minutes.

At Shelbyville, Kentucky, during a thunder-storm on the night of the 4th, the lightning struck several points in the town. Trees, fences, and houses were more or less damaged; the inmates of one of the houses, had a very narrow escape, being made insensible by the fluid. Several valuable cattle were killed.

TELEGRAPHIC COMMUNICATION INTERRUPTED BY ATMOSPHERIC ELECTRICITY.

Fort McKavett, Texas, 20th, 30th.

Fort Elliott, Texas, 1st, 2d, 6th, 29th.

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos have been observed in the various districts on the following dates:

New England, 3d, 5th, 6th, 7th, 8th, 9th, 10th, 21st, 22d, 25th, 28th, 30th, 31st.

Middle Atlantic states, 8th, 9th, 22d, 24th, 26th, 28th.

South Atlantic states, 8th, 11th, 19th, 20th, 24th, 31st.

Florida peninsula, 2d, 23d, 29th, 30th.

West Gulf states, 17th, 23d.

Ohio valley and Tennessee, 3d, 4th, 7th, 8th, 9th, 14th, 15th, 19th, 21st, 24th, 26th, 30th.

Lower lake region, 3d, 5th, 6th, 8th, 16th, 17th, 19th, 24th, 26th, 30th.

Upper lake region, 2d, 5th, 6th, 7th, 8th, 14th, 19th, 21st, 24th to 29th.

Upper Mississippi valley, 3d, 6th, 9th, 14th, 18th, 19th, 24th, 26th, 27th, 29th 30th.

Missouri valley, 20th, 25th. 28th, 30th.

Northern slope, 24th, 25th, 31st.

Middle slope, 7th, 9th, 10th, 16th, 21st, 28th.

Northern plateau, 5th, 11th, 21st, 22d, 24th, 30th, 31st.

North Pacific coast region, 21st, 28th, 31st.

Middle Pacific coast region, 4th, 5th, 13th, 17th, 18th, 22d, 23d, 27th.

Solar halos were also reported from the following stations not included in the districts named above: Saint Vincent, Minnesota, 28th; Bismarck, Dakota, 28th; Campo, California, 1st; Carson City, Nevada, 23d; Salt Lake City, 18th, 22d, 23d, 24th, 28th, 31st.

LUNAR HALOS.

Lunar halos have been observed in the various districts on the following dates:

New England, 23d, 24th, 25th, 26th, 31st.
Middle Atlantic states, 2d, 3d, 5th, 23d, 24th, 25th, 27th to 31st.
South Atlantic states, 1st, 4th, 28th, 30th, 31st.
Florida peninsula, 23d, 24th, 31st.
East Gulf states, 4th, 24th, 26th, 27th, 58th, 30th, 31st.
West Gulf states, 2d, 3d, 24th to 30th.
Ohio valley and Tennessee, 1st, 2d, 25th, 27th, 30th.
Lower lake region, 5th, 6th, 15th, 24th, 25th, 26th, 30th.
Upper lake region, 22d, 25th, 26th, 29th.
Upper Mississippi valley, 2d, 22d, 25th, 26th, 27th, 29th.
Missouri valley, 3d, 23d, 24th, 26th to 30th.
Northern slope, 24th, 25th, 27th, 28th.
Middle slope, 5th, 22d, 23d, 30th.
North Pacific coast region 21st, 26th, 28th, 31st.
Middle Pacific coast region, 4th, 27th.
South Pacific coast region, 1st, 2d, 3d, 25th, 26th.

Lunar halos were also reported from the following stations not included in the districts named above: Stockton, Texas, 22d, 23d, 24th; Fort Yates, Dakota, 28th; Uvalde, Texas, 26th.

MIRAGE.

Indianola, Texas, 1st, 11th, 13th, 22d.
Alexandria, Dakota, 1st, 3d, 14th, 15th, 24th, 28th, 29th.
Northfield, Minnesota, 28th.

MISCELLANEOUS PHENOMENA.

SUNSETS.

The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 189 stations show 5,731 observations to have been made, of which 28 were reported doubtful; of the remainder, 4,902, or 85.9 per cent., were followed by the expected weather.

SUN SPOTS.

The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE—May, 1882.	No. of new		Disappear'd by solar rotation.		Reappear'd by solar rotation.		Total No. visible.		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
1, 4 p. m.	2	4	0	0	1	2	3	12	
2, 2 p. m.	0	8	0	0	0	5	3	20‡	
3, 2 p. m.	0	3	1	3	0	3	3	20‡	
4, 4 p. m.	1	3	1	3	1	1	3	18	
9, 2 p. m.	3	35‡	.....	.....	.....	.....	5	53‡	
10, 2 p. m.	1	5	0	3	1	5	6	53‡	
17, 2 p. m.	.....	.....	.....	.....	.....	.....	4	90‡	Many of the spots small.
18, 3 p. m.	0	0	0	2	0	0	4	90‡	Many of the spots small.
19, 2 p. m.	0	0	1	2	0	0	3	90‡	Many of the spots small.
20, 3 p. m.	1	5	0	0	0	0	4	90‡	Many of the spots small.
22, 3 p. m.	0	0	1	25‡	0	0	2	35‡	
23, 2 p. m.	0	0	0	15‡	0	0	2	20‡	
24, 4 p. m.	1	2	1	15‡	1	2	2	10	
25, 2 p. m.	0	0	0	4	0	0	2	6	
26, 2 p. m.	0	0	1	3	0	0	1	3	
27, 2 p. m.	0	0	0	0	0	0	1	3	
29, 6 p. m.	2	3	0	0	2	3	3	5	
30, 2 p. m.	0	0	0	0	0	0	3	4	
31, 3 p. m.	0	2	0	0	0	0	3	6	

‡Approximated. Faculæ were seen at the time of every observation.

Mr. William Dawson, at Spiceland, Indiana, reports: 1st, three groups, twenty-two spots; one large spot on the the east edge; 7th, five groups, sixty spots, mostly in northeast quadrant; one large spot north of centre; 10th, seven groups, seventy-two spots; condensed group on east edge; 15th, five groups, one hundred and twenty-five spots; three very large groups in the eastern hemisphere; one visible to the unassisted eye; 17th, seven groups, one hundred and fifty spots; one vissible to the unassisted eye; 20th, four groups, seventy-five spots; 22d, two groups, twelve spots; 24th, two groups, ten spots, one spot very close to east edge; 26th, two groups, four spots; one spot very close to west edge and three spots near east edge.

Mr. David Trowbridge, at Waterburgh, New York reports: 2d, two groups, two spots; one large spot just appeared by rotation; 3d, five groups, eleven spots; two groups appeared by rotation and one arisen; faculæ in east; 5th, four groups, six spots; 6th, three groups, seven spots; 7th, seven groups, nine spots; one new group appeared by rotation; 8th, four groups, thirteen spots; 10th, four groups, nine spots; 15th, four groups, seventeen spots; the large group that disappeared on 26th of April has reappeared, and is visible without the telescope; 16th, five groups, twenty-eight spots, one new faint group near the centre of the disk; 17th, three groups, twenty-four spots; the large group is breaking up into smaller spots, but is still visible without telescope; faculæ generally visible; 10th, three groups, twenty-seven spots; 19th, three groups, fifteen spots; 20th, three groups, eighteen spots; 23d, two groups, three spots; the large group visible as two large spots; 24th, one group, two spots; one group has disappeared by rotation; 26th, one group, one spot; the large group has disappeared by rotation, and a new one has appeared by rotation; 20th, two groups, two spots; one new group has appeared by rotation; 30th, three groups, three spots; one faint group has arisen.

Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: sun spots were observed on all clear days during the month; they were largest and most active from the 8th, to the 16th, and smallest at the beginning and close of the month.

The following record of observation has been forwarded by Mr. A. G. Bender, Sacramento, California.

DATE—May, 1882.	No. of new		Disappear'd by rotation.		Reappear'd by rotation.		Total No. of		REMARKS.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Grp's	Spots	
1, 3 30 p. m.	1	4	.....	.....	1	1	3	12	[spots disappeared.
2, " "	1	5	.....	.....	.....	.....	3	12	One group of four
4 " "	1	2	.....	.....	.....	.....	3	7	Group which app'd 30th ult, disapp'd.
5 " "	1	3	.....	.....	.....	.....	4	10	Perhaps re-app'd.
6 " "	.....	.....	.....	.....	.....	.....	4	12*	New spots.
8 " "	1	1	.....	.....	.....	.....	5	12*	Changes in spots (size and position.)
10 " "	.....	.....	.....	.....	.....	.....	4	10*	One group disappear'd
11 " "	.....	.....	.....	.....	1	20*	5	30*	
12 " "	1	5	.....	.....	.....	.....	6	35*	
14 4 "	.....	.....	1	1	.....	.....	5	35*	
15 " "	.....	.....	1	5	1	5*	4	35*	One group of one spot disapp'd. Much change in groups.
16 " "	.....	.....	.....	.....	.....	.....	4	35*	Two of these groups may be but one.
21 " "	.....	.....	.....	[more 10 or	.....	.....	4	20*	Portion of groups disapp'd by rotation.
22 " "	.....	.....	1	10	.....	.....	3	10*	Remainder disapp'd by rotation.
23 " "	.....	.....	1	4	.....	.....	2	6*	Perhaps only one gr'up of one large and five small spots.
25 " "	.....	.....	.....	2	1	1	3	3	Part of group disapp'd by rotation.
26 " "	.....	.....	2	2	.....	.....	1	1	Rest of group disapp'd by rotation, and also the large spot.
29 " "	.....	.....	.....	.....	1	1	2	2	
31 " "	.....	.....	.....	.....	.....	.....	2	2	

24th cloudy; otherwise, on omitted days, only the changes due to solar rotation were observed.
*Estimated.

METEORS.

Yuma, Arizona, 14th, 20th.
Charleston, Illinois, 16th
New Corydon, Indiana, 9th, 16th.
Vevay, Indiana, 16th, 23d.

Clinton, Iowa, 22, at 2.30 a. m. A large and brilliant meteor appeared in the heavens at a point a little south of west and at an elevation of 50°. It passed rapidly downward, and

disappeared when about 10° above the horizon. During its passage it emitted a train of sparks, apparently several feet in length. Before its disappearance it broke into several fragments. Two distinct detonations were heard. Another meteor was also observed at this station on the twenty-ninth.

Monticello, Iowa, 23d, 24th.
Yates Centre, Kansas, 8th.
Woodstock, Maryland, 13th, 14th.
Rowe, Massachusetts, 7th.
Thornville, Michigan, 23d.
Freehold, New Jersey, 3d.
Weldon, North Carolina, 27th.
Stateburg, South Carolina, 16th, 19th, 23d, 27th.

POLAR BANDS.

Laconia, Indiana, 29th.
New Corydon, Indiana, 1st, 2d, 14th, 15th, 19th, 24th, 25th, 26th.
Gardiner, Maine, 8th.
Freehold, New Jersey, 7th.
Woodstock, Vermont, 9th.

EARTHQUAKES.

Pagosa Springs, Colorado, 11th, at 8 p. m.: A slight shock of earthquake was felt at this place. It is also reported to have been felt in the mountains about twenty-two miles east of that place.

ZODIACAL LIGHT.

New Haven, 15th.
Nashville, 5th, 10th, 15th to 19th, 22d.
Monticello, Iowa, 15th, 16th.
Yates Centre, Kansas, 5th, 8th, 15th, 16th.
Cambridge, Massachusetts, 5th, 6th, 7th, 15th, 16th.
Atco, New Jersey, 7th, 16th, 18th.
Waterburg, New York, 5th, 7th,15th, 16th.
Dyberry, Pennsylvania, 26th.

PRAIRIE AND FOREST FIRES.

Port Huron, Michigan, 9th.
Moorhead, Minnesota, 4th, 5th, 6th.
Saint Vincent, Minnesota, 4th.
Fort Yates, Dakota, 15th.
Fort Stevenson, Dakota, 24th.
Yankton, Dakota, 1st, 2d, 3d, 6th, 12th, 13th, 25th.
North Platte, Nebraska, 1st, 3d.
Fort Brady, Michigan, 17th to 20th.
Cresswell, Kansas, 15th.
Wytheville, Virginia, 2d, 3d, 17th.

DROUGHT.

Fort Missoula, Montana, 16th; crops suffering for want of rain.

INSECTS.

Saint Meinrad, Indiana, 31st: Great damage has been done to the hay crop by the cut worm.

Guttenburg, Iowa, 31st: The chinch-bug has appeared in the wheat fields in great numbers.

Ardenia, New York, 31st: The Colorado beetle has appeared and is injuring potatoes.

Ashwood, Tennessee: The army worm appeared during the first part of the month and did great damage to wheat, barley and the meadows. A species of cut worm also appeared, and did considerable injury to cotton and garden vegetables. At the end of the month the army worm disappeared.

Little Rock, Arkansas, 12th: Farmers in this vicinity report that the cut worm is doing great injury to crops.

Nashville, Tennessee, 13th: It is reported that the army worm is doing considerable damage, especially in the eastern part of the state.

Pike's Peak, Colorado, 18th: Countless numbers of millers or moths appeared on the snow during the prevalence of a southwest wind.

Hickman, Kentucky, 12th: Reports from many sections of the country show that the army worm is very destructive and is ruining wheat, meadows and corn in many localities.

Cairo, Illinois, 10th: The army worm is doing much damage to young potatoes and corn in the surrounding country.

Huntsville, Alabama, 5th: Army worms have appeared in large numbers and are doing considerable injury to wheat.

Chinch-bugs and army worms are reported as doing much damage in Texas.

SAND STORMS.

Stockton, Texas, 4th, 9th.
Yuma, Arizona, 5th, 6th, 7th, 13th, 24th, 25th.
Winnemucca, Nevada, 9th
Umatilla, Oregon, 2d, 10th, 18th.
Camp Thomas, Arizona, 2d. 5th, 19th, 20th, 25th, 26th, 29th, 30th.
Lewiston, 12th.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR:

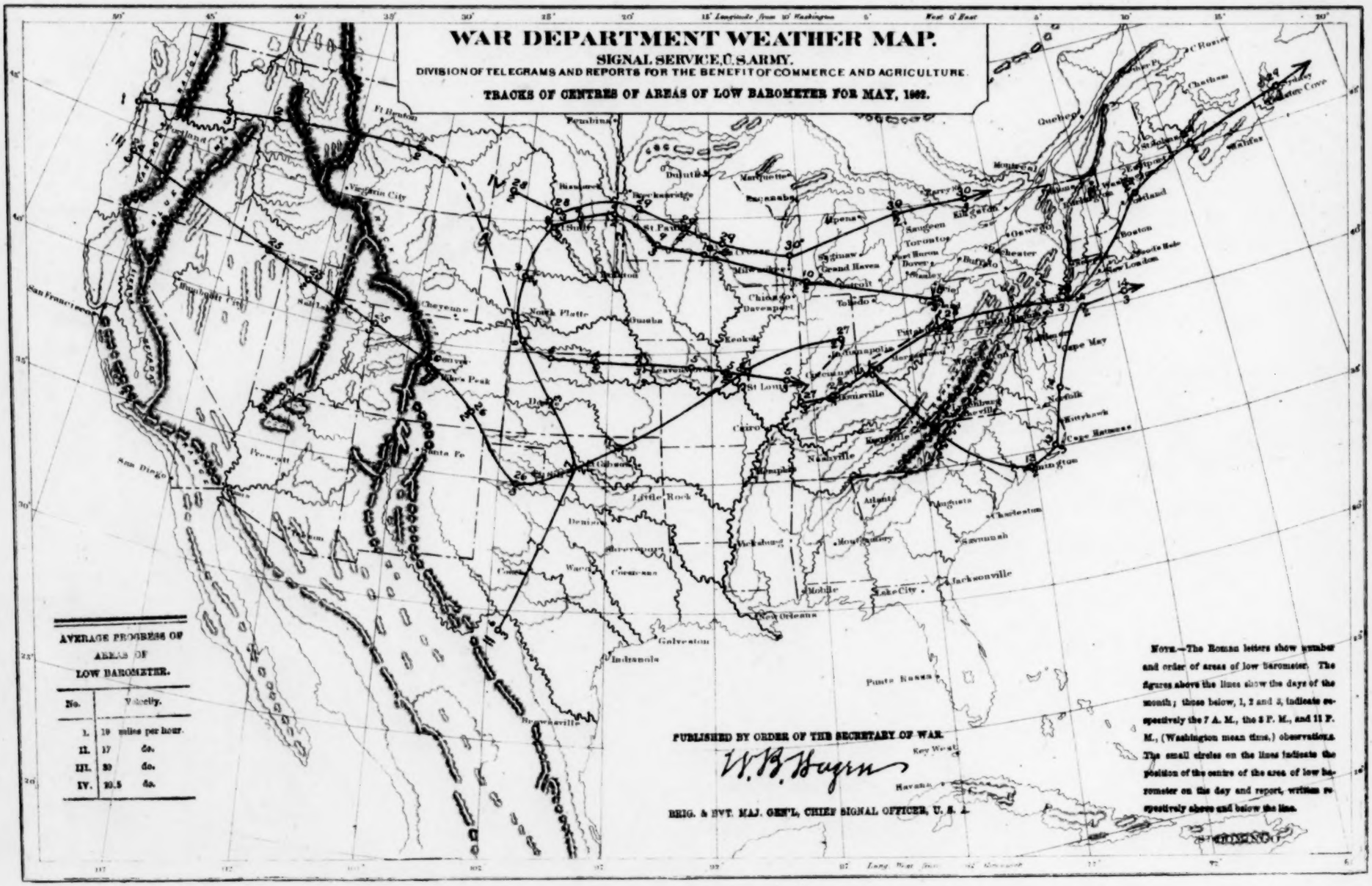
W. B. HAZEN,
Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

Copy furnished for

Entered at the Post Office, Washington, D. C., as Second-Class Matter.

This Paper is furnished by the Government of the United States, without charge, to the Co-operating Observers acting with the Signal Office in the collection of Simultaneous Reports.

No. I.


WAR DEPARTMENT WEATHER MAP.
SIGNAL SERVICE, U. S. ARMY.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.
TRACKS OF CENTRES OF AREAS OF LOW BAROMETER FOR MAY, 1882.
AVERAGE PROGRESS OF AREAS OF LOW BAROMETER.
No. | Velocity.
I. 19 miles per hour.
II. 17 do.
III. 30 do.
IV. 20.5 do.
PUBLISHED BY ORDER OF THE SECRETARY OF WAR.
W. B. Hazen
BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7 A. M., the 2 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

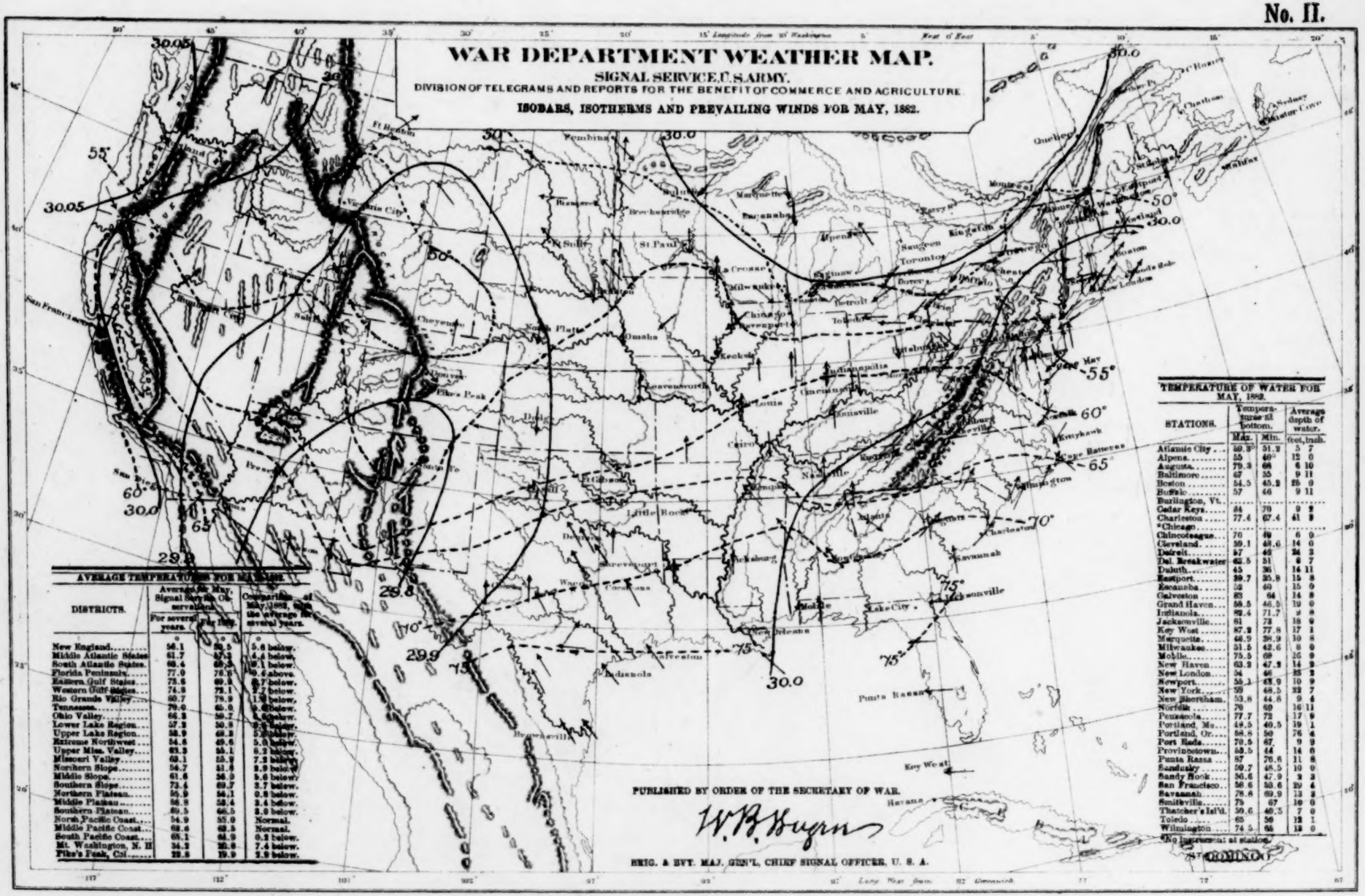
No. II.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

ISOBARS, ISOTHERMS AND PREVAILING WINDS FOR MAY, 1882.



AVERAGE TEMPERATURE FOR MAY, 1882.

DISTRICTS.	Average for May, Signal Service Observations. For several years.	For May.	Comparison of May, 1882, with the average for several years.
	°	°	°
New England	56.1	50.5	5.6 below.
Middle Atlantic States	61.7	57.3	4.4 below.
South Atlantic States	68.4	68.3	0.1 below.
Florida Peninsula	77.0	78.6	0.6 above.
Eastern Gulf States	73.6	69.4	4.2 below.
Western Gulf States	74.8	73.1	1.7 below.
Rio Grande Valley	80.7	78.9	1.8 below.
Tennessee	70.0	65.0	5.0 below.
Ohio Valley	66.8	59.2	7.6 below.
Lower Lake Region	57.3	50.8	6.5 below.
Upper Lake Region	54.9	49.3	5.6 below.
Extreme Northwest	54.6	49.6	5.0 below.
Upper Miss. Valley	63.3	55.1	8.2 below.
Missouri Valley	63.1	55.9	7.2 below.
Northern Slope	54.7	51.8	2.9 below.
Middle Slope	61.6	56.9	5.0 below.
Southern Slope	72.4	69.7	2.7 below.
Northern Plateau	55.9	54.1	0.8 below.
Middle Plateau	56.9	53.4	3.4 below.
Southern Plateau	69.5	66.5	3.0 below.
North Pacific Coast	54.9	55.0	Normal.
Middle Pacific Coast	62.6	62.5	Normal.
South Pacific Coast	68.1	64.9	0.2 below.
Mt. Washington, N. H	34.2	26.8	7.4 below.
Pike's Peak, Col	32.8	29.9	2.9 below.

TEMPERATURE OF WATER FOR MAY, 1882.

STATIONS.	Temperature at bottom. Max.	Min.	Average depth of water. feet, inch.
Atlantic City	60.3°	51.2	5 7
Alpena	55	49°	12 0
Augusta	79.3	66	6 10
Baltimore	67	55	9 11
Boston	54.5	45.2	25 0
Buffalo	57	46	9 11
Burlington, Vt.			
Cedar Keys	84	70	0 2
Charleston	77.4	67.4	41 8
*Chicago			
Chincoteague	70	49	6 9
Cleveland	59.1	48.6	14 0
Detroit	57	46	24 2
Del. Breakwater	62.5	51	8 7
Duluth	45	36	14 11
Eastport	59.7	35.8	15 8
Escanaba	52	40	15 0
Galveston	83	64	14 8
Grand Haven	58.5	46.5	10 0
Indianola	82.4	71.7	9 8
Jacksonville	81	73	18 0
Key West	87.2	77.8	17 1
Marquette	48.9	38.9	10 8
Milwaukee	51.5	42.6	8 0
Mobile	75.5	69	25 9
New Haven	63.2	47.2	14 2
New London	54	46	25 2
Newport	58.1	48.9	10 9
New York	59	48.5	22 7
New Shoreham	53.8	44.8	9 4
Norfolk	70	60	16 11
Pensacola	77.7	72	17 9
Portland, Me	48.5	40.5	19 1
Portland, Or	68.8	50	76 4
Port Eads	70.5	67	9 9
Provincetown	53.5	44	14 0
Punta Rassa	87	76.6	11 8
Sandusky	59.7	48.5	10 0
Sandy Hook	56.6	47.9	2 2
San Francisco	56.6	50.6	29 4
Savannah	78.8	69.9	13 2
Smithville	75	67	10 0
Thatcher's Isl'd	59.6	46.5	7 0
Toledo	65	50	12 1
Wilmington	74.5	66	13 0

*No instrument at station.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

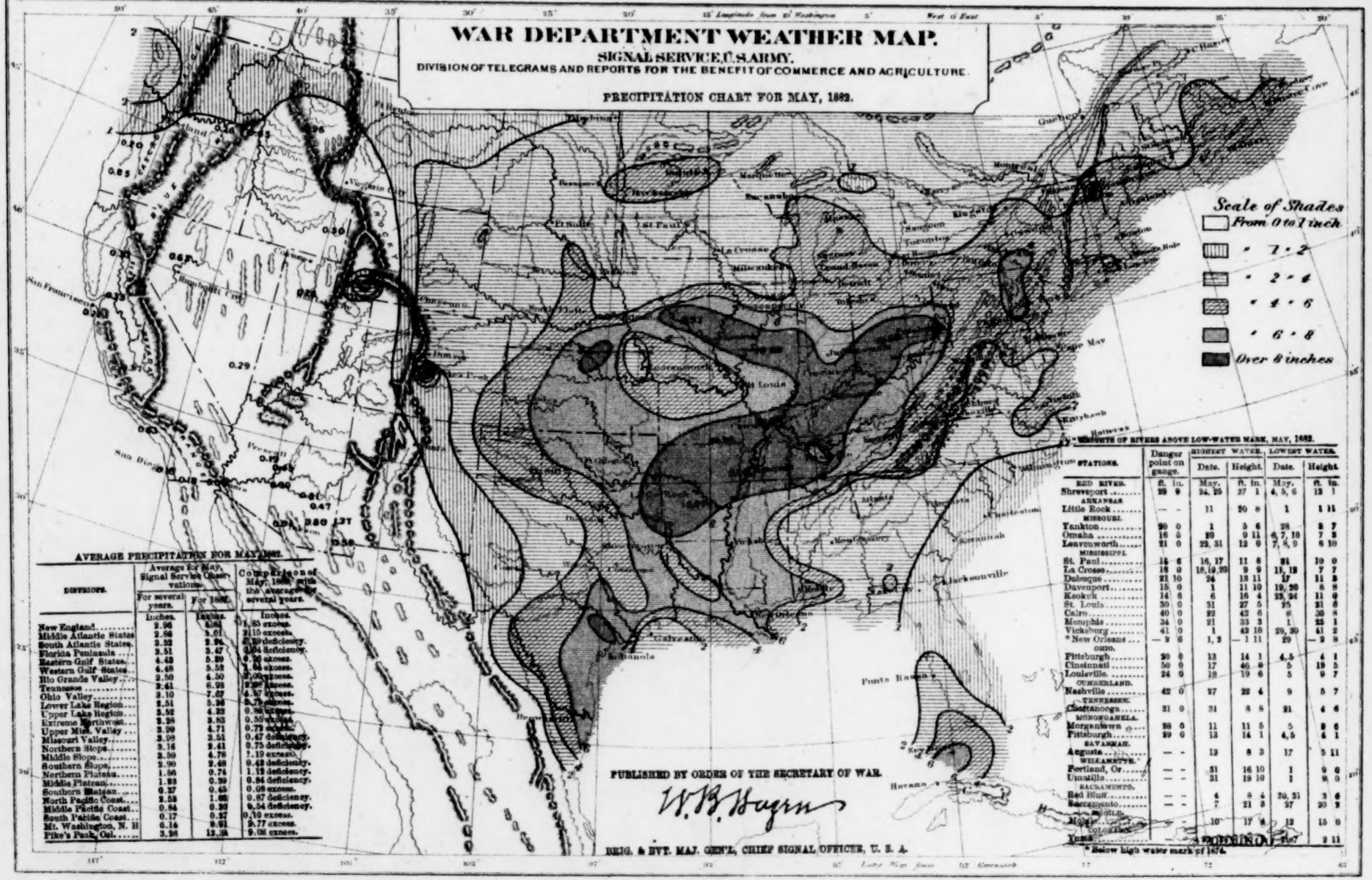
No. III.

WAR DEPARTMENT WEATHER MAP.

SIGNAL SERVICE, U. S. ARMY.

DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

PRECIPITATION CHART FOR MAY, 1882.



AVERAGE PRECIPITATION FOR MAY, 1882.

DISTRICTS.	Average for May, Signal Service Observations. For several years.	Average for May, Signal Service Observations. For 1882.	Comparison of May, 1882, with the average of several years.
	Inches.	Inches.	Inches.
New England	2.96	4.81	1.85 excess.
Middle Atlantic States	2.86	5.01	2.15 excess.
South Atlantic States	3.33	2.94	0.39 deficiency.
Florida Peninsula	3.51	3.47	0.04 deficiency.
Eastern Gulf States	4.43	5.39	0.96 excess.
Western Gulf States	4.46	5.58	1.12 excess.
Rio Grande Valley	2.50	4.50	2.00 excess.
Tennessee	3.41	6.98	3.57 excess.
Ohio Valley	3.10	7.67	4.57 excess.
Lower Lake Region	2.51	5.26	2.75 excess.
Upper Lake Region	2.52	4.23	0.98 excess.
Extreme Northwest	2.26	3.53	0.50 excess.
Upper Miss. Valley	3.99	4.71	0.72 excess.
Missouri Valley	3.08	3.51	0.47 deficiency.
Northern Slope	3.16	2.41	0.75 deficiency.
Middle Slope	3.59	4.78	1.19 excess.
Southern Slope	2.90	2.43	0.43 deficiency.
Northern Plateau	1.90	0.74	1.16 deficiency.
Middle Plateau	1.23	0.39	0.84 deficiency.
Southern Plateau	0.27	0.45	0.08 excess.
North Pacific Coast	2.53	1.66	0.87 deficiency.
Middle Pacific Coast	0.84	0.30	0.54 deficiency.
South Pacific Coast	0.17	0.27	0.10 excess.
Mt. Washington, N. H	6.14	9.91	3.77 excess.
Pike's Peak, Col	3.98	13.36	9.38 excess.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L, CHIEF SIGNAL OFFICER, U. S. A.

HEIGHTS OF RIVERS ABOVE LOW-WATER MARK, MAY, 1882.

STATIONS.	Danger point on gauge.	HIGHEST WATER. Date.	HIGHEST WATER. Height.	LOWEST WATER. Date.	LOWEST WATER. Height.
	ft. in.	May.	ft. in.	May.	ft. in.
RED RIVER.					
Shreveport	29 9	24, 25	27 1	4, 5, 6	13 1
ARKANSAS.					
Little Rock	— —	11	20 8	1	1 11
MISSOURI.					
Yankton	20 0	1	5 6	28	9 7
Omaha	16 0	10	9 11	6, 7, 10	7 3
Leavenworth	21 0	23, 31	13 0	7, 8, 9	6 10
MISSISSIPPI.					
St. Paul	14 6	16, 17	11 8	31	10 0
La Crosse	18 0	18, 19, 20	9 9	13, 19	7 7
Dubuque	21 10	24	18 11	17	11 8
Davenport	15 0	1	11 10	19, 20	8 8
Keokuk	14 6	6	16 4	23, 24	11 0
St. Louis	30 0	31	27 5	25	21 6
Cairo	40 0	22	42 6	8	30 8
Memphis	34 0	21	33 3	1	25 1
Vicksburg	41 0	1	43 10	29, 30	41 2
* New Orleans	— 2 6	1, 2	— 1 11	29	— 2 8
OHIO.					
Pittsburgh	30 0	13	14 1	4, 5	4 1
Cincinnati	50 0	17	46 6	5	19 5
Louisville	24 0	18	19 6	5	9 7
CUMBERLAND.					
Nashville	42 0	27	22 4	9	5 7
TENNESSEE.					
Chattanooga	31 0	31	8 8	21	4 6
MONONGAHELA.					
Morgantown	28 0	11	11 5	5	2 6
Pittsburgh	29 0	13	14 1	4, 5	4 1
SAVANNAH.					
Augusta	— —	13	8 3	17	0 11
WILLAMETTE.					
Portland, Or	— —	31	16 10	1	9 6
Umatilla	— —	31	18 10	1	9 0
SACRAMENTO.					
Red Bluff	— —	4	8 4	29, 31	3 6
Sacramento	— —	7	21 3	27	20 3
[illegible]	— —	[illegible]	[illegible]	[illegible]	[illegible]
Mobile	— —	10	17 6	12	15 0
COLORADO.					
Yuma	— —	[illegible]	[illegible]	[illegible]	2 11

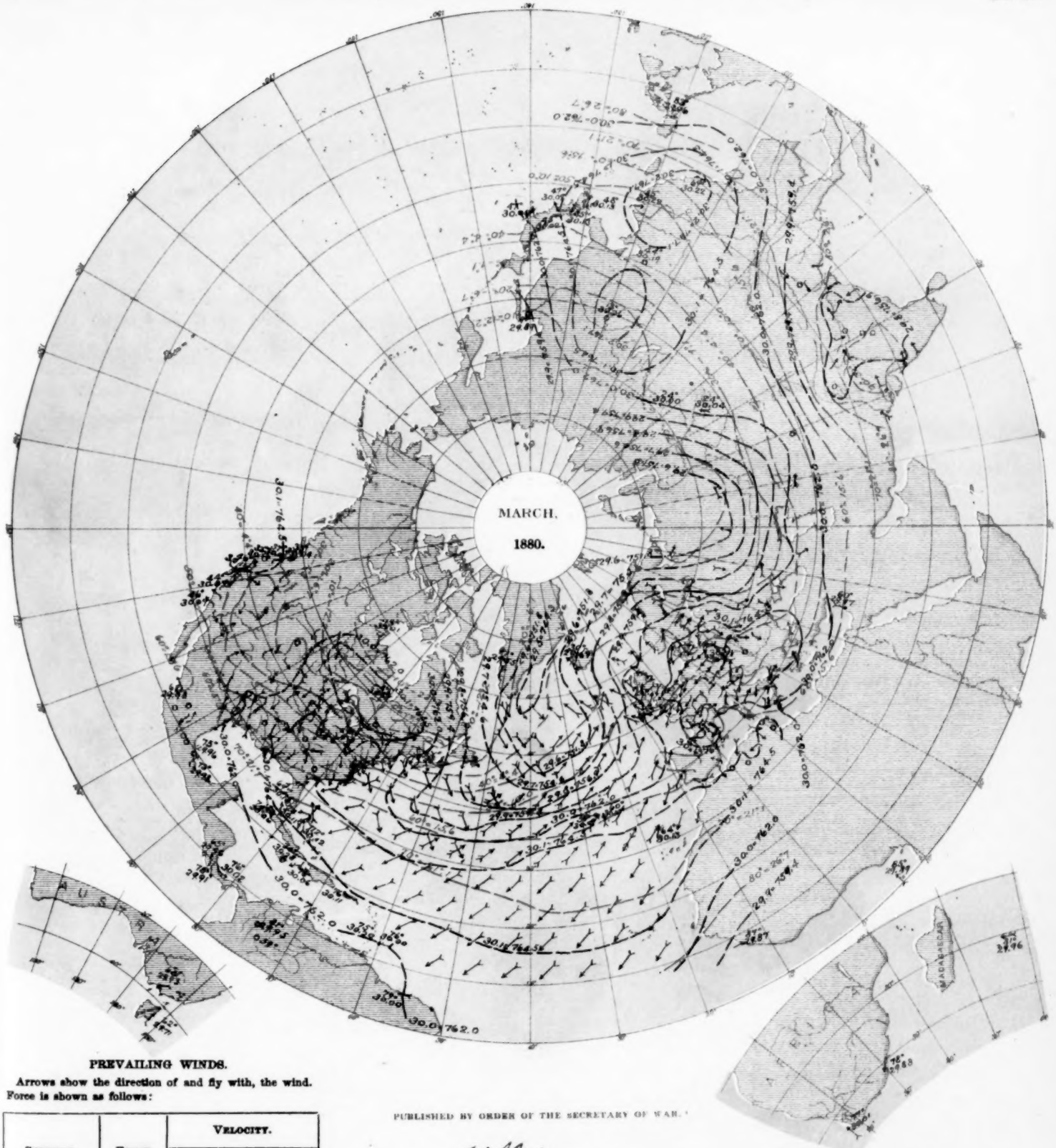
* Below high water mark of 1874.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing January, 1877.

No. IV.



PREVAILING WINDS.

Arrows show the direction of and fly with, the wind.
Force is shown as follows:

Symbols.	Force.	Velocity.	
		Miles per hour.	Metres per second.
O	0	0	0
→	1, 2	0 to 9	0 to 4.0
→	3, 4	9.1 to 22.5	4.1 to 10.1
→	5, 6	22.6 to 40.5	10.1 to 18.1
→	7, 8	40.6 to 67.5	18.1 to 30.2
→	9, 10	67.6 up.	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG. & BVT. MAJ. GEN'L.
CHIEF SIGNAL OFFICER U. S. A.

ISOBARS AND ISOTHERMS.

Isobars in *black*; detached barometer means in English inches.

Isotherms in *red*; detached temperature means in degrees Fahrenheit.

Broken lines, are doubtful.

INTERNATIONAL MONTHLY CHART.

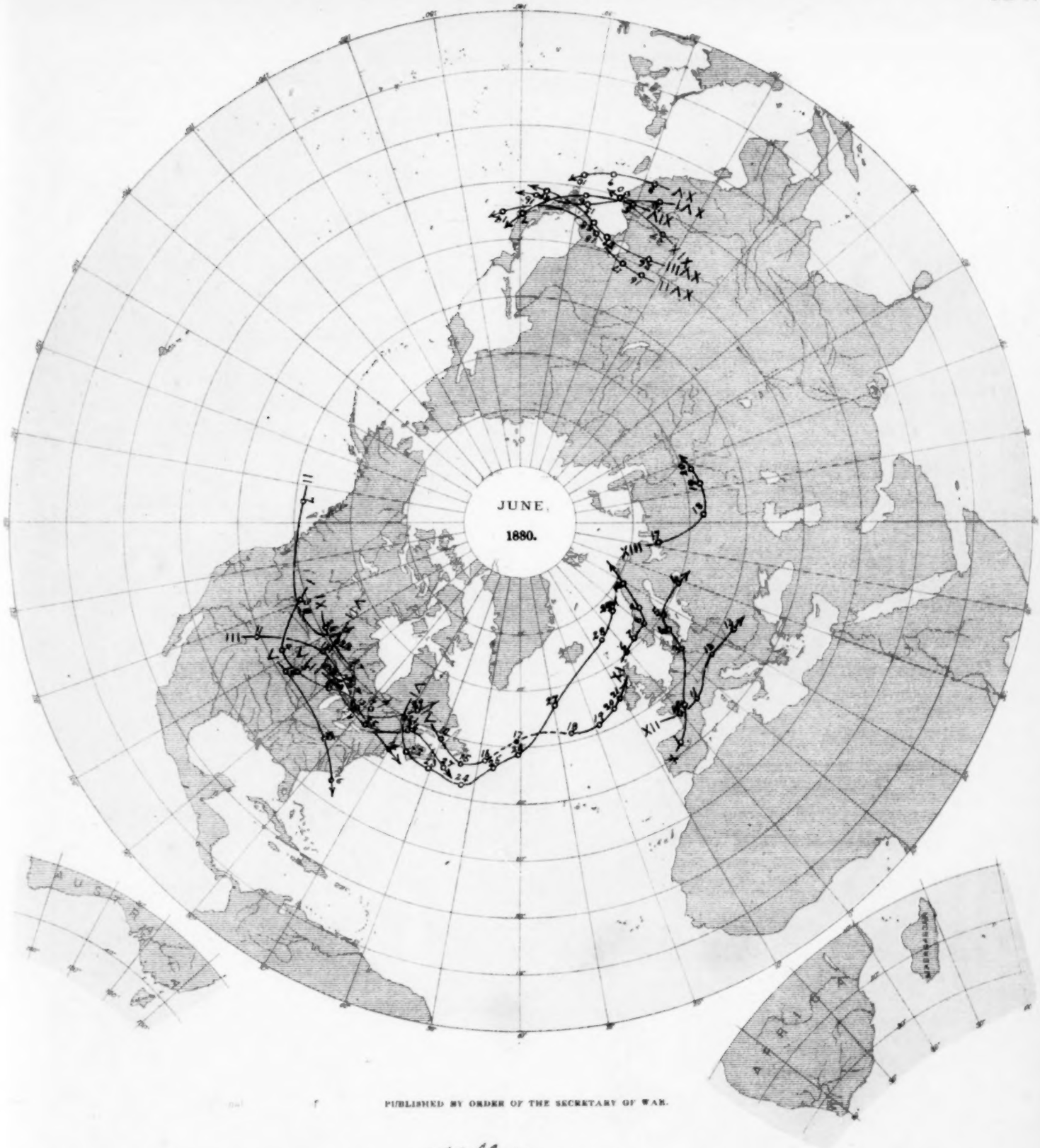
Showing mean pressure, mean temperature, mean force and prevailing direction of winds at 7:35 A. M., Washington mean time, for the month of March, 1880 based on the daily charts of the International Bulletin.

Office of the Chief Signal Officer,

UNITED STATES ARMY.

Charted from Actual Observations taken Simultaneously, Series commencing November, 1877.

No. V.



PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

W. B. Hazen

BRIG & BVT. MAJ. GEN'L
CHIEF SIGNAL OFFICER, U. S. A.

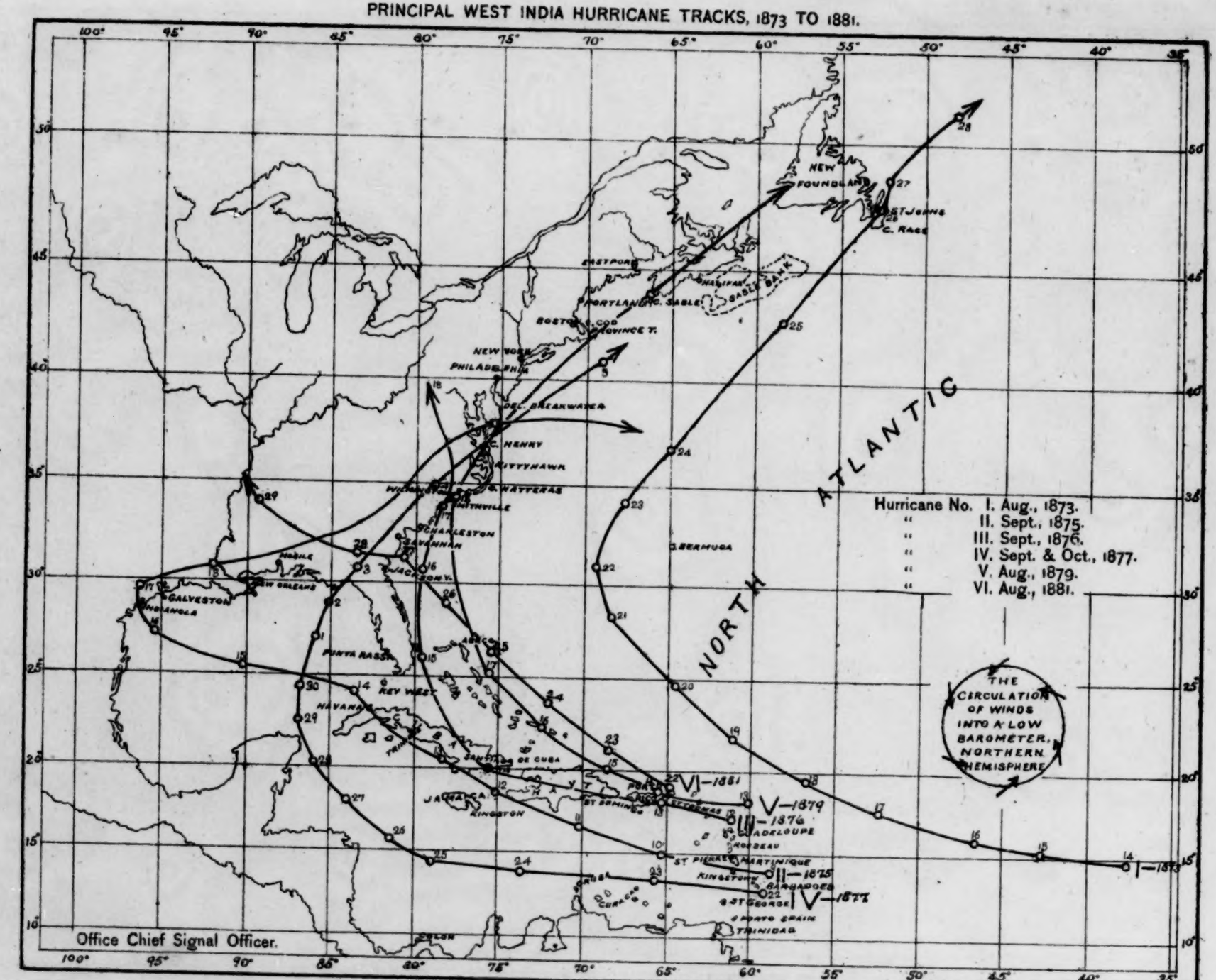
Storm-tracks in *Black*. The Arabic numerals show location of the centres of Low Barometer, at 7:35 A. M., Washington mean time, of that date.

Broken or dotted lines, are doubtful.

INTERNATIONAL CHART.

Showing Tracks of Centres of Low Barometer for June, 1880.

PRINCIPAL WEST INDIA HURRICANE TRACKS, 1873 TO 1881.



No. VII.

No. VII.

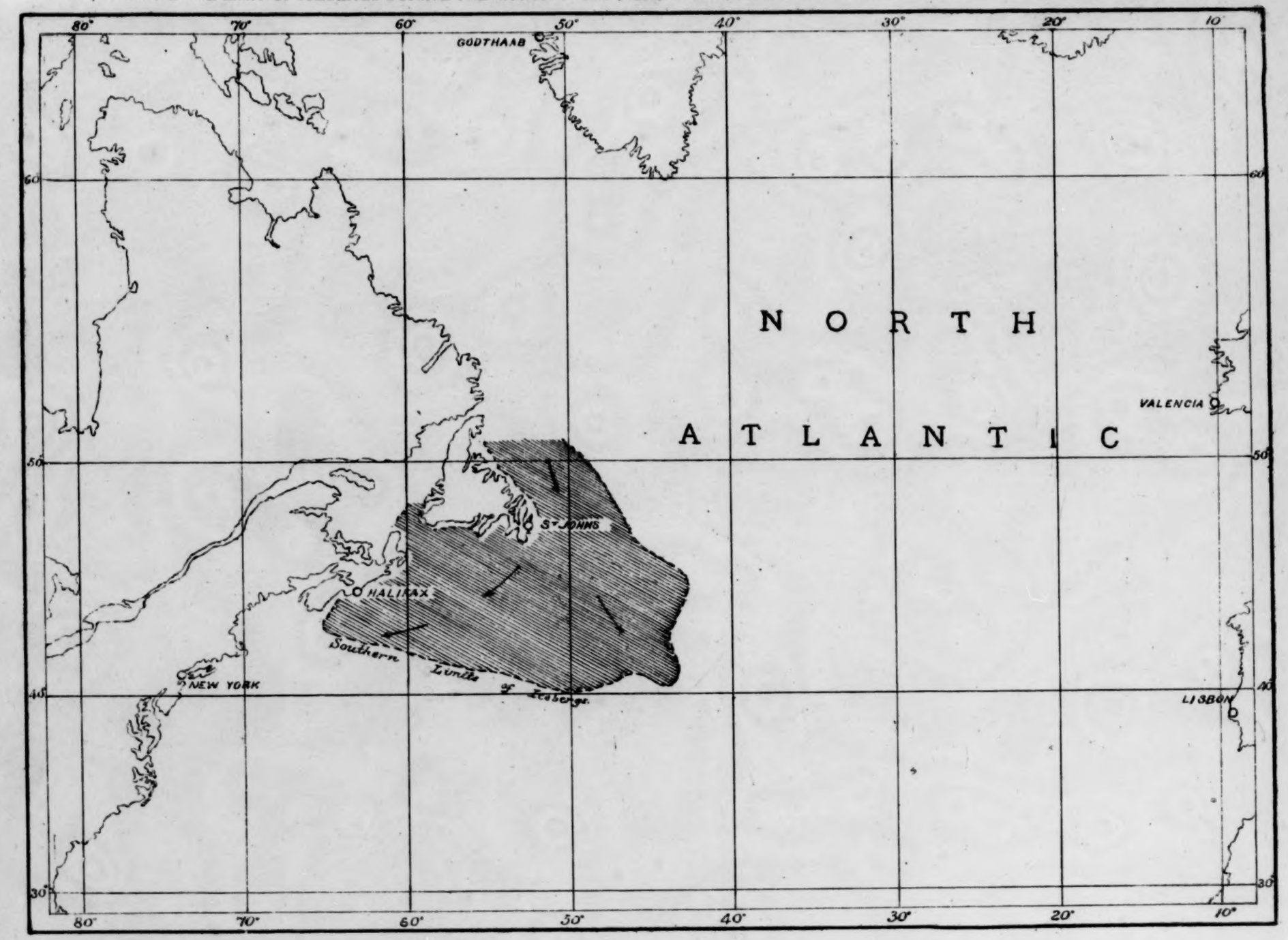



CHART SHOWING THE LIMIT OF ICEBERGS DURING THE MONTH OF MAY, 1882, FROM OBSERVATIONS ON FILE IN OFFICE OF THE CHIEF SIGNAL OFFICER.